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PEOPLE'S HEALTH AND STATE'S RESPONSIBILITIES*

NEITHER the Interim Government nor the Provincial Ministries had any part in the appointment of the Bhore Committee. Perhaps this is an advantage as we can bring impartial judgment to bear in our discussion of the Report. We can all agree, however, that a comprehensive survey of this kind was necessary and we are thankful to Sir Joseph Bhore and the members and secretary for the diligence and thoroughness with which they discharged their immense task. As far as I am aware in no country except South Africa has such a comprehensive review of the health services been undertaken and few committees have been faced with such an extensive field of enquiry. The survey of present conditions which has been given in the Report should be studied by all who are in any way connected with, or interested in, health administration and health conditions. No one can read it without being convinced of the most urgent need for an effective programme to improve the health of the people.

The facts of high mortality, sickness and disease and the inadequacy of our hospitals and health services have of course long been known to us in a general way. We read frequently enough of the progress of epidemics which would be startling in their magnitude if we were not so accustomed to them. Wherever we go in town and village, the defects of our sanitary services come to our notice only too often. Our high death rate of 24 as compared with 11 in other countries and our appalling infantile mortality rate of 169 per thousand births have frequently been published. But I think we needed a review of this kind to bring home to us how serious the position is and how rudimentary and inadequate our services are, to compel us to cast off apathy and indifference and to stir us to activity.

State's Responsibilities

There was a time when health was regarded as being largely the personal concern of the individual. That conception still lingers, but we have travelled far from the days of *laissez faire*. It was the ravages of an epidemic disease which first compelled the State to intervene. In India the great plague epidemic of the nineties led to the setting up of the Plague Commission and the development of public health organizations in some of the larger towns. The latest example is the great cholera epidemic following on the famine in Bengal which provided the incentive for a considerable improvement in the medical organization, and to a lesser extent in the public health services, in that Province. Such stimuli, however, are to some extent fortuitous and are apt to be transient. In recent times a more permanent and a more effective incentive comes from the growth of social consciousness, of democratic ideals and of a new conception of social welfare and of the rights and duties of the individual and the responsibilities of the

*Extracts from an Address delivered by Sir Shafaat Ahmad Khan, Member for Education, Health and Arts, to the Conference of Health Ministers, on 10th Oct. 1946, at New Delhi.

State. It is now accepted that health is one of the goods of life to which man has a right. He has a right to those conditions of living in which health can be achieved and maintained and, when he is ill, to the medical treatment necessary for his recovery. Health like education, must, therefore, become a function of the State. The objective of the State must be to create the conditions for healthy living, to provide as complete a health service as possible and to include within its scope the largest possible proportion of the community. In India it will take a long time to realise these aims owing to the paucity of our financial resources and our large population but the Centre is prepared to take an active part in promoting them with the help and co-operation of the Provinces.

A large proportion of our people are living below the normal level of subsistence and the State must provide for them the medical benefits for which they themselves are unable to pay. As far as our resources permit we should avoid imposing a "means test" and should make our medical services accessible to all without distinction.

A spur to action should be the realisation that a disease-ridden community cannot be a prosperous community The President of that great and wealthy country, the United States, has said that the United States could afford many things but ill-health was one thing they could not afford. The Bhore Committee has put the matter in another way in saying that a nation's health is perhaps the most potent single factor in determining the character and extent of its development and progress. Certainly no development programme can be complete or effective without adequate provision for measures of improving the health of the people.

Influence of Environment

I will not attempt to cover the whole field of the Committee's report but I should like to refer to two or three matters on which the Committee has rightly laid emphasis and which, self-evident though they may be, are as yet imperfectly understood. The first is the influence of conditions of living and environment on the health of the individual and the community. It is idle to talk of health to a person whose cereal ration is far below the standard necessary to maintain normal health and vigour; or to persons living ten in a room in a slum tenement; or to those who through poverty are unable to obtain the essential necessaries of life. Health is indeed affected by the whole of man's environment, by the conditions in his home, at school and at his place or work, by his economic condition and security of employment. It follows that the responsibilities of those of us who are concerned to any degree with the health of the people extend far beyond the hospitals and it is necessary that we should take an interest in all those Government or social activities which promote health or might be used to promote it. There are Government and municipal activities which have been, and are still being, carried on without relation to, or even to the detriment of, the needs of national health. I need only refer to road and railway construction which has often through faulty design led to an increase in malaria. Private enterprise also is frequently responsible for practices which are inconsistent with national health. If we are to improve our national health all our Governmental and social activities must be reviewed from the point of view of their effect on normal health.

Preventive Measures

Another matter which the Committee emphasises is the need for an improvement in environmental hygiene, and preventive measures generally. if a substantial improvement in health is to be secured. They have pointed out that unless we can clear up our towns and villages and provide a safe and adequate water supply they will continue to be factories of ill-health which will fill all the hospitals we can provide. If we look to the West we find that the fall of 50 per cent. in the death-rate which occurred in the second half of the last century has been attributed largely to the improvement in sanitary conditions. A safe water supply, an efficient system of scavenging and refuse disposal and in the towns adequate sewerage have long been recognised as the primary necessaries of civilised life in any community. But they are necessities in which we in India are still deficient. Even in some of the largest towns, the sanitary organisation is notoriously inefficient, while in the rural areas there has been in most Provinces no systematic attempt to improve sanitary conditions. If there is a question of priorities—and planning means priorities—I think all will agree that an active programme for the improvement of water supply and sanitation in our towns and villages is one of the most urgent of our needs.

Another equally important item in the programme for the improvement of living conditions is that of housing and the planning of our towns. That is a subject of considerable complexity and difficulty and will I think have to be dealt with at a special conference. As a preliminary to an inter-Government discussion I propose, if the Provincial Governments agree, that it would be useful to call a conference of Chairmen of Improvement Trusts and Development Boards. Then there is of course the whole field of preventive medicine. The development of modern science since 1880, the discoveries of Pasteur, Koch, Manson and Ross and countless other workers, by revealing the cause of disease and its process, has given us the knowledge without which all efforts at prevention or control are at best empirical. I will refer only to one disease—malaria. Here we have a disease which is not only the direct or indirect cause of tremendous mortality but is also responsible for an incalculable amount of disablement. No one can deny that if we could get rid of or control this disease we should substantially increase our national productivity and vitality. Science has revealed to us not only the cause and the method of transmission of the disease but has placed in our hands powerful larvicides, insecticides and drugs. It remains for us to find means for effective application of the knowledge made available to us. Control is expensive but it pays dividends and I am confident that with

enthusiasm and determination, by planned experiment and a resolute search for economical methods of control a large measure of success can be achieved. Most Provinces have included anti-malaria schemes in their plans although some of them are on a very meagre scale. An exception is Bombay which plans to control malaria over two whole districts with a population over one million. There is another particularly important aspect of malaria control. As you are aware the incidence of malaria has often been greatly increased through engineering works by faulty design of culverts, by inadequate provision for drainage and by excavation of burrow-pits. It is imperative that the creation of this man-made malaria should be avoided in the big programme of railway and road construction which lies ahead. A committee of experts has been set up to recommend what measures should be taken to avoid creating conditions favourable to the spread of malaria and I hope we shall have its report in the near future.

Epidemics

While speaking of prevention I should like to refer to the measures for dealing with epidemics. We are still visited by great epidemics of cholera, smallpox and plague. In the cholera season three to four thousand deaths a week is not unusual. While eventually as our health programme develops it should be possible to reduce these preventable diseases to small proportions, there is in the meantime a need for more vigorous measures to check epidemics in the early stages and to provide treatment for those who have the misfortune to be attacked. This is a matter in which the Government of India are particularly interested as they are concerned with the spread of disease from one province to another. Disease does not recognise provincial or any other boundaries and in this matter Provinces have a duty not only to their own people but to their neighbours.

I have suggested two priorities—sanitation and malaria. As a third I suggest the provision of health services in the rural areas. As one who comes from rural stock I know well how neglected these areas have been in the past. We have here and there a few dispensaries, mostly inadequately staffed and equipped; there may be a sanitary inspector with an area in his charge so large that nothing substantial can be achieved; but as the Bhore Committee says, "it is only the outermost fringe of such public services and amenities as the country enjoys that occasionally comes within the orbit of the cultivator's daily life". I do not suggest that we should neglect the towns where, indeed, mortality and sickness are often even higher than in the countryside. But after all over 80 per cent. of our people live in the rural areas and the time has come for an effective programme to bring the benefits of modern medical science within the reach of the cultivator. The Bhore Committee has suggested for this purpose the development of a district health organization with a primary health centre for every 40,000 people, a thirty-bed hospital for every 200,000 and a secondary centre with a 200-bed hospital for each district. This is not I think an extravagant programme to be carried out over a period of ten to twenty years, and is, I understand, the minimum organization which the Bhore Committee considered to be necessary to provide a reasonably effective, curative and preventive health service. The question of implementing this recommendation is one of the items on our agenda.

Local Self-Government Institutions

Whatever organization may be adopted, I have no doubt that both in the rural areas and the towns it must be organically related to our local self-government institutions. Our local bodies have their defects; they are known only too well to all of us. But they are our safeguard against bureaucracy; and bureaucracy means routine, centralisation, the loss of adaptability to changing conditions and leads eventually to authoritarianism. Moreover, as the Bhore Committee has pointed out, a health organization can attain its objective only with the co-operation of the people themselves. The people themselves must take an active part in the protection of their own health through self-governing bodies in rural and urban areas which reflect the needs of the individual citizen. Our problem is to secure a minimum standard of efficiency. The Bhore Committee's solution for co-ordination of the health administration with local self-government and for securing an efficient health administration is one of the matters we have to discuss.

Training of Personnel

The training of personnel is evidently a matter which must be given special attention in the early years of development. The building up of training institutions takes time, while the training of medical officers and some other categories of personnel takes some years. Unless adequate provision is made in the early years therefore, development in later years will inevitably be hampered. There are at present only about 47,000 qualified doctors in the country. The Bhore Committee has estimated that for the first five years of their scheme an additional 15,000 medical men will be required. The number of nurses requires to be doubled or trebled even to provide an adequate staff for existing institutions. The number of midwives is at present about 5,000 whereas it is estimated that for an adequate maternity service something like 100,000 would be required. These figures give some indication of the dimensions of our problems.

There are, of course, many other matters which require consideration. There is nutrition and the question of school feeding which has given such good results in other countries. There is the question of school health services. There are the maternity and child welfare services. These services hardly exist in India at present. When we recall that nearly 25 per cent. of the deaths among the people of India take place among children in the first year of life and that the corresponding percentage in the United Kingdom is six, the need for maternity and child welfare services is clear. There is the question of industrial health services and health insurance. A report by a scientific worker under the Medical Research Council which is being circulated to you will give some indication of the urgent need in the field of industrial health. There are the important proposals of the Committee relating to medical

education which have been referred to the Medical Council of India for their opinion. There are the problems of special diseases such as tuberculosis, venereal diseases and leprosy. These and other matters will, I hope, be subject for discussion at a future conference.

QUESTION OF EXPENDITURE

Then there is the matter of finance. We must face inescapable realities and one of these is the limitation imposed by our resources. But I have no doubt that if we are serious in our desire to build up the people's health and do not pay mere lip service to an ideal, we must devote a larger part of our resources to health. The pre-war average of expenditure on medical relief and public health was about 5 per cent. of the total expenditure or about 5 annas per head. In Ceylon the corresponding figures were 10 per cent. of the total expenditure and Rs. 2 per head of population. The Bhore Committee has suggested that the amount of Government expenditure on health should be increased to at least 15 per cent. of the total expenditure. Provincial Governments have already been informed of the assistance that is likely to be available to the Provincial Governments from the Centre in the form of general development grants but this assistance will be of little avail unless there is a substantial increase in the provision for the health services from provincial resources.

CENTRAL GOVERNMENT'S PLANS

Before I close I should like to say something of our own plans. Detailed plans for health development must of course be made and carried out by Provincial Governments. Our function here is largely to assist by co-ordination, provision of expert advice, and development of activities and institutions which are beyond the scope or capacity of individual Provinces. Within these limitations the Interim Government will do all in their power to assist sound health development in India. The most important recommendation of the Bhore Committee in relation to central activities is that concerning the establishment of an All-India Institute with up-to-date facilities for training and research of the highest standard. I think the conception is a fine one and we propose to pursue the scheme actively and expeditiously. I propose to set up very shortly a small committee to advise the Government on the scheme. We also intend to provide facilities at Calcutta for medical licentiates from all parts of India to enable them to take their M.B.B.S degree and we have taken over surplus American buildings and hospital equipment for the purpose. While we must develop medical education in India as rapidly as possible, we must in the meantime send selected students abroad for higher training. There is no doubt that we have not at present in India the facilities for advance post-graduate training which are to be found in other countries and I hope we shall be able to place abroad, under recognised leaders in the various branches of medical science, at least fifty of our most promising men in each year. There is also a good deal to be said for enabling some of our specialists to go abroad for short periods. Most of our scientific workers have been cut off from contact with workers abroad during the war and I feel that there will be a considerable advantage in enabling some of them to travel abroad, make contacts with scientific workers in other countries and study at first hand recent scientific development. We are expanding the staff and accommodation of the Malaria Institute of India to enable it to play its part in the drive against malaria which, we hope, will be set on foot in all Provinces. In the field of research I have no doubt that far greater assistance must be given than in the past and the proposals of the Bhore Committee are being considered in consultation with the Indian Research Fund Association.

In the field of nursing, in which India is so woefully backward, we are assisting in the higher training of future nursing administrators and specialists by the establishment of a nursing college which will provide a course for a University degree in nursing as well as shorter specialised courses. It is hoped to develop in this institution in due course facilities for training in public health nursing. The legislative proposals for the regulation of the pharmacy profession which are already before the Central Legislature will be pursued and I hope that we shall also be able to introduce similar legislation for the dental and nursing professions. The arrangements for the enforcement of drug standard control, which is of such importance to the country, are in hand and the control will be introduced from the 1st April next. We also intend to develop what I may call the advice and information services. For example a Bureau is being set up with the function of collecting information and advising Provinces regarding the design and equipment of medical institutions. Another subject which is engaging our attention is that of the data relating to population and vital statistics. Vital statistics are the foundation for public health work and there is a great and urgent need for improvement in the quality and speed of collection of such statistics. The growth of population is of course one of our large problems. I will not enter this controversial field now but there is a clear need for the collection and co-ordination of data relating to population growth. This is important not only from the point of view of material for study of the so-called population problem but also from that of long-term planning generally. These are some of the more important activities which we have in view and I hope that we may be able to extend them in directions in which Provincial Governments and Institutions need assistance.

With the establishment of our own National Interim Government at the Centre we have entered the "age of hope". Let us go forward in company to make it the "age of achievement". The building of a Nation's health is no easy task. With our meagre resources we shall not be able to advance as rapidly as we should like; but it is a task worthy of all our energies and devotion. And no task is more important for the national welfare, for without health we cannot have happiness or contentment or prosperity. With co-operation, sustained effort and determination I am confident that we can succeed.

CYCLES IN DHARWAR SEDIMENTATION

By Dr. C. S. PICHAMUTHU
(University of Mysore)

NOW that the sedimentary origin of many of the constituents of the Dharwar System in Mysore has been recognised, it is for consideration whether these ancient sediments share any of the characteristics of later formations. There are many aspects of this problem, but attention will be confined here to one of the important features of thick accumulations of sedimentary rocks, namely, the recurrence in cycles of sequences of certain types of sediments.

Sediments usually accumulate to great thicknesses in large subsiding troughs which are called geosynclines, and subsequently these areas become mountain ranges. The general course of events is somewhat as follows: the geosyncline gradually sinks during long ages; this downwarp gets slowly filled in by sediments which accumulate as sinking goes on; the geosynclinal downwarp caused by the accumulation of thousands of feet of sediments in such a basin of deposition results in the rise of the isogeotherms; this produces expansion and lateral pressure as a consequence of which the sediments are folded; further increase of pressure causes overfolds and thrusts, and the final expression of this is orogenesis when the geosyncline is elevated to form a mountain range. Each orogenic revolution is accompanied by abyssal injection and followed by volcanic action.

This sequence of events must undoubtedly leave an impress on the type and structure of the rocks. The nature of a sedimentary deposit has a direct bearing on the depth at which it is formed, and in a subsiding basin, the succession is ordinarily a conglomerate, followed by sandstones, clays, and limestones. In metamorphosed regions, the rock sequence is conglomerates, quartzites, schists, and crystalline limestones. This sedimentary cycle can be observed in several formations of different ages in India, *e.g.*, in the Salt Range and Spiti areas, and in the Cuddapah and Vindhyan formations. The cycle is not often complete or obvious because of the disappearance of strata due to denudation or to tectonic disturbances.

The Dharwars are much more ancient in age, and hence the probability of the preservation of evidences of such sedimentary cycles is somewhat less. It is remarkable, however, that though the Dharwars have been highly disturbed and metamorphosed, the sedimentary sequence in many regions is reasonably clear. In such favourable areas the sedimentary cycle can be recognised.

This succession of quartzites, shales or schists, and limestones is seen in many occurrences of Archæan rocks in the Peninsula. The Aravalli System starts with a basal quartzite and is succeeded by phyllites, and cherty limestones. In the Delhi System, quartzites are succeeded by phyllites and biotite schists which are overlaid by calc-schists and calc-gneisses. In the Gangpur Series, the succession is quartzites, mica schists and phyllites, and dolomitic and calcitic marbles. The Sausar Series commences with a quartzite overlying which are schists, calciphyres, dolomites, and crystalline limestones. In Bastar State, the oldest Pendulner Stage is composed mostly of quartzite; this is overlain by the Bengpal Series which is formed of andalusite-greiss and cordierite-gneiss which represent metamorphosed aluminous sediments; the Bailadila Iron Ore Series which comes next is formed mainly of calc-schists, amphibolites, and banded ferruginous quartzites. In many other regions, schists succeed quartzites, but the limestones are wanting.

It is interesting to note that in Mysore State also this sedimentary cycle can be recognised. In the Shimoga Schist Belt, both the middle and upper Dharwars exhibit very well the sequence of conglomerate, quartzite, schist, and limestone.

Shimoga Schist Belt

Upper Dharwars—
Ferruginous quartzites.
Thin bands of limestone.
Agrillitic calcareous silts.
Quartzites.
Conglomerates.

Middle Dharwars—
Banded hæmatite quartzites.
Limestones and dolomites.
Phyllitic and chloritic schists.
Secicitic grits and quartzites.
Conglomerates.

Chitaldrug Schist Belt

Upper Dharwars—
Ferruginous and Manganiferous quartzites.
Chalybitic rocks.
Clay schists and phyllites.
Sandstones.
Conglomerates.

Middle Dharwars—
Banded ferruginous quartzites.
Limestones
Shales, phyllites and schists.
Quartzites and grits.
Conglomerates.

Thus we see that the Dharwar sediments in their order of deposition conform generally to what has been noticed not only in the younger formations but in the analogous rock series in other parts of India. In this respect, the Dharwars of the Peninsula resemble also the Pre-Cambrian formations of China, United States, and Canada.

From what has been said above it is clear that in the Dharwars of Mysore, two distinct sedimentary cycles can be recognised each commencing with a conglomerate which passes on into quartzites (often showing current bedding and ripple marks), and succeeded by shales or schists, and limestones associated with banded manganiferous or ferruginous quartzites.

Epochs of sedimentation have always been followed by intervals of vulcanism. The geological record contains many examples of vulcanism after a period of geosynclinal sedimentation. The earliest records throughout the world bear ample evidences of this, and the sedimentary rocks are seen to be intruded by

and interbedded with igneous material. The Dharwars, again, are no exception to this. In Mysore, as in similar formations in many other parts of the world, the Dharwars start with an igneous complex of basic, intermediate, and acid lava flows and intrusives. Then the middle Dharwar cycle of sedimentation commences. At the closing phases of this cycle, extensive igneous action takes place. Batholiths and stocks of acid rocks have stoped their way upwards and some of them have reached the surface. In the Shimoga Schist Belt we have examples of the granite masses of Rangandurga, Balekal, and Shimoga; and, in the Chitaldrug Schist Belt, the Pitlali and Bukkapatna granites. It is probable that at this stage the sediments were thrown up into huge mountains.

Subsequent to such mountain building activity, minor intrusions and volcanic flows, mainly of the composition of basalts are usual, and in the Dharwars of Mysore we have again good examples of such igneous phenomena. In the Shimoga Schist Belt there are the Bababudan epidiorites, and in the Chitaldrug Schist Belt, the Jogimardi and Bellara traps.

The mountain ranges of this period were then subject to erosion and peneplanation, and the stratified rocks of the second cycle would then have been laid down upon a probably folded and faulted and planed-off body of rocks, commencing with conglomerates and succeeded by quartzites, shales, limestones, and ferruginous quartzites. The same sequence of events must have been repeated, ending again with a period of igneous activity. The granitic rocks which have now been identified as portions of the Peninsular Gneiss, and the hornblendic and norite dykes are evidences of this third phase of vulcanism which marked the close of the second cycle of Dharwar sedimentation.

It will thus be seen that in the Dharwars of Mysore we can recognise at least two distinct cycles of sedimentation each with its attendant igneous phenomena.

FOURTH INTERNATIONAL CONGRESS FOR MICROBIOLOGY

NEWS has been received at the office of the Indian National Committee of the International Association of Microbiologists that the Fourth International Congress for Microbiology will be held at Copenhagen, Denmark, from July 20th to 26th, 1947. The business of the Congress will be conducted through 9 sections, as follows :—

Section I.—General Microbiology; Antibiotica; Growth substances. *Section II.*—Medical and Veterinary Bacteriology; Diphtheria; Pertussis ; Pathogenic streptococci ; Tuberculosis Brucellosis. *Section III.*—Viruses and Viral Diseases; Poliomyelitis; Influenza. *Section IV.*—Serology and Immunology; Fundamental Principles of Serology, partly in relation to Infection-Biology, partly from physical and chemical view-points. *Section V.*—Variation and Mutation in Micro-organisms; Adaptation; Induced Mutation. *Section VI.*—Plant Pathology and Mycology; Plant pathogenic bacteria —their taxonomy and nomenclature; Nomenclature of plant viruses; Physiologic (pathogenic) races of fungi; Fungus flora and decay in wood pulp. *Section VII.*—Water and Soil Microbiology; Antibiotic activity in the soil; Nodule bacteria and nitrogen fixation in the soil; Microbiological methods for determination of soil fertility; Autotropic bacteria; Methods for quantitative determination of *Escherichia coli* in water; Pathogenic bacteria in sewage; Bacteriology of the biological purification of sewage. *Section VIII.*—Dairy and Food Microbiology; Sour-milk for therapeutic purposes; Lactic acid bacteria in silage; Food poisoning. *Section IX.*—Alcoholic and other Fermentations; Butanol-acetone fermentation; Food yeast.

The International Society for Microbiology was established in 1930 "with the object of promoting scientific thought by creating a closer relationship between scientific workers in different countries, and especially of spreading the idea that all its members were united in a common ideal of peace and constant friendship."

The Society is directed by a Central International Committee and a Permanent Commission. The Central Committee is composed of members of the Society's Board, the members of the Permanent Commission and the Chairmen of the National Committees.

Each country of geographical region forms a National Committee made up of workers in various universities, research institutes and other institutions concerned. The constitution enjoins that workers wishing to contribute papers must apply for membership through the National Committee of the country concerned and when the Central Committee approves of such application, they then become full members on payment of the required fee. The office of the Fourth International Congress is located at Kommunehospitalet, Copenhagen, Denmark. The office of the Honorary Secretary, Indian National Committee (Dr. A. C. Ukil), is located at the All-India Institute of Hygiene and Public Health, 110, Chittaranjan Avenue, Calcutta, from whom further information on the subject can be obtained.

For the information of those who will contribute papers, it is stated that a summary not exceeding 200 words should be in the hands of the General Secretary of the Congress at Copenhagen not later than the 1st January, 1947.

UNITED NATIONS RELIEF AND REHABILITATION ADMINISTRATION SOUTHWEST PACIFIC AREA INTERNATIONAL VETERINARY AND LIVESTOCK SECRETARIAT

By A. C. MATHUR

(*Imperial Council of Agricultural Research*)

THE U.N.R.R.A. is made up of 47 member-nations. Each contributing nation provides funds based on its national income for the year ending 30th June, 1943. India is one of the member countries and has contributed relief to the peoples of other lands. It has already made one contribution of Rs. 80 million to U.N.R.R.A.'s work and a second contribution of Rs. 20 million has been voted by the legislative assembly.

The first task of the U.N.R.R.A. is to provide relief; to distribute food, clothes, and medical supplies. In the war-devastated countries, due to the breakdown of the veterinary services and to emergency slaughter of animals for food as well as to the actual destruction of livestock by military operations, the number of the livestock are halved, quartered and in some places almost wiped out. Livestock, as we know, plays a very important role in relief and rehabilitation as it provides food and clothing, power for planting and reaping the crops and aid in maintaining fertility.

To facilitate the provision of such relief in the south-west Pacific area there has been set up an International Veterinary and Livestock Secretariat by U.N.R.R.A. The Governments of the following countries are members of this secretariat. Australia, China, France, India, Netherland East Indies, New Zealand, Philippines, United Kingdom, U.S.S.R., and United Kingdom, U.S.S.R., and United States of America, and in addition the Commander-in-Chief, United States Armed Forces, Pacific, and the Supreme Allied Commander, South-East Asia are also members.

In order to facilitate collaboration among Far-Eastern Governments in connection with international epizootic control and regulations governing such controls, each of the member governments was requested to appoint a veterinarian to confer with representatives of other Governments, at a meeting held at Sydney, Australia, on the 14th to 17th December 1945.

Dr. F. C. Minett, D.SC., M.R.C.V.S., Director, Imperial Veterinary Research Institute, Mukteswar, was appointed representative of the India Government.

After each representative at the Conference had described the chief livestock difficulties which confronted their country the conference considered the following 'Notes on Agenda' which had been prepared by a Veterinary Advisory Group composed of eminent veterinary specialists. The notes are as follows :—

1. *Functions of UNRRA SWPA International Veterinary Secretariat*—

(*a*) Exchange between countries of information on Epizootic Diseases :
- (i) Statement on incidence of virus, bacteriological, protozoal, and parasitic diseases in member countries.
- (ii) Exchange by monthly bulletins of information regarding incidence of infectious diseases.
- (iii) Re-establishment of publication of monthly statistical bulletin, based on information supplied by contracting countries as was carried out by the International Bureau of Epizooties in Paris before the war.
- (iv) Transmission by cable or telegram of the occurrence for the first time in the reporting country of scheduled diseases, or of extension of these diseases into areas previously unaffected.
- (v) Nature of common *pro forma* on which the monthly report should be submitted.
- (vi) Exchange between contracting countries explaining the method of veterinary organisation in force, the qualifications and type of training undergone by their veterinary officials, the relative strength of their veterinary personnel as contrasted with their human and animal populations and the methods of control adopted within their territories for controlling infectious diseases.
- (vii) Desirability when transmitting information concerning infectious diseases of inclusion of maps or diagrams showing extent and distribution of particular disease in the reporting country.

(*b*) Acceptable internationally of health certification :
- (i) The purpose of health certification.
- (ii) Schedule of diseases covered by health certification—(*a*) Infectious, (*b*) Other.
- (iii) Nature of certifying authority.

(*c*) Exchange of information on manufacture and marketing of biological products :
- (i) Preparation of a list of biological products manufactured by member countries.
- (ii) Methods of standardisation and control of biological products.
- (iii) Provision for regular interchange of information.

(*d*) International movement and transfer of livestock-quarantine, inoculation, etc.

(*e*) Animal Meat and Animal Products :
- (i) Import and export of meat.
- (ii) Import and export of animal products other than meat.

(*f*) Exchange of administrative, research and other workers and provision of post-graduate educational facilities.

(*g*) Provision for loan of trained technical personnel to countries requiring assistance in an emergency.

(*h*) Possibility of allowing any contracting country to despatch temporary missions or establish permanent veterinary officials in any of the other contracting countries.

2. *Organisation for UNRRA SWPA International Veterinary Secretariat*—

(a) Temporary organisation under UNRRA Administration.
(b) Permanent organisation under control of United Nations.

3. *Relations of UNRRA SWPA*, etc., with other Regional Groups or countries.

To be sub-secretariat of International Office in Paris.

Following a full discussion the conference adopted twenty-seven Resolutions covering all items on the agenda and incorporating details of information required to be completed, for transmission to the secretariat, by each member country. The Veterinary Secretariat was made responsible for the collection and dissemination to member states, of information in regard to all aspects of the livestock industries of member states, including the incidence and control of diseases and the breeding and feeding of livestock.

The collection and dissemination of information as far as it pertains to India is being undertaken by the Imperial Council of Agricultural Research, and the Veterinary Secretariat in Sydney is disseminating to member countries all useful information which it gets from time to time. Accordingly the Imperial Council of Agricultural Research has received a list of contagious diseases prevalent in the Philippines, Netherland East Indies and New Zealand. A copy of these lists may be had on application to the Secretary, Imperial Council of Agricultural Research, New Pusa, New Delhi.

CENTRAL NATIONAL MUSEUM FOR INDIA

A PLAN for the early establishment of a Central National Museum of Art, Archæology and Anthropology in Delhi, has been completed by the Special Committee appointed by the Government of India for the purpose.

The Committee of which Sir Maurice Gwyer, Vice-Chancellor of the Delhi University, was Chairman, has recommended that the Museum should comprise a Directorate and five Departments, namely, (1) Art, (2) Prehistoric Archæology, (3) Historic Archæology—Buddhist, Jaina, Brahminical, Muslim, (4) Numismatics and Epigraphy and (5) Anthropology—cultural and physical. There will also be a Circulating Department, a Library and a Chemical Laboratory.

The need for such a central institution has been keenly felt in this country since 1912, when the Government of India approached the Secretary of State for the establishment of an Oriental Research Institute in India. This need was repeatedly stressed also in subsequent official reports.

Finally in 1945, the need to establish a Central National Museum was expressed in a Resolution submitted to Government by the Central Advisory Board of Archæology, and was supported by the Standing Committee of the Legislature for Education. The Government of India accepted the recommendation in principle and appointed a Committee of 11 members, under the chairmanship of Sir Maurice Gwyer to frame details. The terms of reference to the Committe included the functions (powers, etc.) of the Museum, general administration, internal organisation, site and building.

The main aim of the Central National Museum is to present to the world the material contribution of India to the sum total of human civilisation. To achieve this the Museum will have to maintain a thoroughly representative collection illustrating the arts, crafts and cultures of India down to recent times; and at the same time museum technique and museum service in India will have to be raised to the high international standard.

Committee's Recommendations

The Committee have, therefore, recommended that in the first stage of the scheme a highly trained nucleus staff consisting of a Director and two Keepers may be appointed, and the Keepers be sent on a carefully planned foreign tour which should include a detailed examination of the construction, administration, methods of display, etc., of museums in Great Britain and America.

The function of the Museum will be twofold: to further research and to offer guidance to laymen. The Committee have laid special emphasis on the importance of selecting a suitable Chief Librarian, who will be competent to guide staff and approved research students and scholars in regard to published material in all branches of the Muslim's work.

It has also recommended the appointment of five guide lecturers, one for each section, who will give a series of popular lectures both for schools and for the general public.

The creation of a Circulating Department is another feature of the scheme. The main purpose of this Department (modelled on a similar department in the Victoria and Albert Museum, London) will be to prepare and send out classified loan collections to towns and educational institutions.

On the analogy of other institutions of the kind, the Committee have recommended that the museum should be controlled by a Governing Body including representatives of appropriate Government Departments together with non-officials representing various special interests. The Governing Body should be autonomous, subject only to such conditions as the Government of India may attach to their block grant.

The Museum will be located in Delhi, and the Committee has chosen a site for it. The whole scheme will be worked out in three distinct stages and is estimated to involve, when complete, an annual expenditure of nearly eight and a half lakhs.

NATIONAL STANDARDS FOR INDIA

THE Government of India have decided to set up an organisation called the Indian Standards Institution with headquarters in New Delhi with the object of evolving national standards in respect of structures, commodities, materials and operations, and for promoting standardisation, quality control and simplification in industry and commerce.

The Institution will be managed by a General Council consisting of the Hon'ble Member for Industries and Supplies (President), and 64 representatives from the Central Government Departments, Provinces, States, Research Institutions, Chambers of Commerce and others.

It will be financed by Government and contributions from industry, the Provinces, States and interested public bodies, subscriptions from members and by sale of Indian standards and specifications The Government of India have decided initially to make grants for a period of five years.

The Institution will be divided into five sections, *viz.*, engineering, building, chemicals, textiles, and food and agricultural products, each to be controlled by a Divisional Council. The actual preparation of standards will be done by small committees of experts representing various interests such as the producers, consumers and technical experts.

The Institution will be non-official, although supported by the Government of India. The membership will be open to all interested in its objects. Organisations, companies, firms, educational institutions and corporate commercial bodies will be enrolled as Sustaining Members and individuals interested in the work of the Institution as Ordinary Members. The annual subscription has been left to the discretion of the subscriber, but to allow even the smallest industry to benefit by the scheme the minimum subscriptions have been fixed at Rs. 250 per annum for Sustaining Members and Rs. 25 per annum for Ordinary Members.

Maintenance of Standards.—The establishment of the Institution is intended to raise the standard of Indian products to he level of other industrial countries. It is recognised that the marketability of any commodity or product depends, firstly upon the intrinsic worth of the commodity and, secondly on the consumer's confidence in the specifications; in other words, on efficiency in production and on the maintenance of standards. One of the chief problems of industries in India is the quality of production.

Again, unless India falls in line with international standards, her export trade will suffer. It is, therefore, of considerable importance to India's peace-time production that her industries, old and new, should be helped to organise on scientific lines and that the standard of Indian products should be raised to the international level. A national standards organisation is thus indispensable to the industrial development of a country.

Vast Industrial Plans.—Due to the diversity of raw materials available in India and the processes employed for manufacture, the British and other standards are not always suitable for adoption in this country.

The proposal to establish a central standards organisation in India for fixing standards was first raised at the Twelfth Industries Conference held in Lucknow in December 1940. Due to the war, however, the Government could not pay much attention to this. With the vast industrial plans that are contemplated in the immediate future, this question has become one of urgent importance. The Government of India accordingly prepared a scheme for establishing a central standards organisation in India which has been generally accepted by all Provincial Governments, Indian States, Chambers of Commerce, and other important industrial organisations.

Objects of Institution.—The objects for which the Institution is being established are *inter alia* to :—

(1) Prepare and promote the general adoption of standards on National and International basis relating to structures, commodities, materials, practices, operations, etc. and from time to time revise, alter and amend the same.

(2) Consider and recommend to Government, national standards for the measurement of length, weight, volume and energy.

(3) Promote standardization, quality control and simplification in industry and commerce.

(4) Adopt such measures and take such steps and do all such things, as may in the opinion of the General Council, be conducive to the promotion of cordial relations between the Institution and persons interested in he objects of the Institution.

(5) Co-ordinate the efforts of produters and users for the improvement of materials, products, appliances, processes and methods.

(6) Provide for the registration of standardization marks applicable to the products, commodities, etc., for which it issues standards, to be branded on or applied to those products, commodities, etc., which conform to the standards set.

(7) Provide or arrange facilities for the examination and testing of commodities, processes, and practices and for any investigation or research that may be necessary.

(8) Procure the recognition of the Institution in any foreign country or place.

(9) Collect and circulate statistics and other information relating to standardizaion in all its branches.

(10) Establish and maintain libraries, museums and laboratories for the purpose of furthering the practice of standardization.

It has been decided that the Institution should be registered under the Registration of Societies Act. A meeting of the General Council will be convened early to consider the terms of the Memorandum of Association and Rules and Regulations.

A DWARF MUTANT IN *NEGLECTUM VERUM* COTTON

By T. R. KHADILKAR
(*Cotton Breeder, Jalgaon*)

IN the year 1941 a dwarf plant with very small leaves and flowers was noticed by the writer in a large population of cotton plants belonging to the neglectum group and growing in the breeding area of the Jalgaon Farm. Its botanical characteristics and the genetic nature of dwarfness when studied gave the following information.

TABLE I

Characters of the mutant and normal plants

S. No.	Character	Mutant	Normal	Remarks
1	Plant height	30 cm.	100 cm.	The mutant plant presented a very distinct appearance in the field (Plate I).
2	Leaf length	6·5 ,,	12 ,,	
3	Length of middle lobe of leaf	5·0 ,,	10 ,,	
4	Breadth of middle lobe of leaf	1·1 ,,	2·1 ,,	
5	Margin of leaf	Wavy with stray projections	Smooth	
6	Presence of sinus lobes in a leaf	Present	Present	
7	Length of petal	3·4 cm.	4·7 cm.	
8	Breadth of Petal	2·1 ,,	3·7 ,,	
9	Petal colour	Deep yellow	Deep yellow	
10	Length of bract	2·4 cm.	2·9 cm.	
11	Breadth of bract	1·5 ,,	2·4 ,,	
12	No. of teeth in the bract	7	7	
13	Androeceum	Sparsely developed.	Normal	
14	Gynæceum	Stigma elongated, ovules sterile.	Stigma normal, ovules normal.	

* Figures in the table are the averages of six measurements in each case.

The above table shows that the various plant parts of the mutant are about half of the normal in size in most cases except the height which is about one-third of the normal. The number of teeth of the bract is, however, the same in both. The andrœceum and gynæceum show normal development in the dwarf.

The few flowers that were found on the mutant did not set fruit either when selfed or crossed with a normal plant indicating its female sterility. When used as a male parent, however, for crossing with a normal plant it produced normal fruits and seeds.

The plant was crossed with two pure strains, *viz.*, N.R. 5 and B. XXI, with a view to study the genetical behaviour of the dwarf habit. Contrasting characteristics of the female parents are given in the table below:—

TABLE II

Parent	Petal colour	Habit of growth	Sinus lobe
N.R. 5	White (yy)	Normal (DD)	Present (ss)
B XXI	Pale yellow(yy)	Normal (DD)	Absent (SS)

TABLE III

Behaviour of F_1 and F_2 of the cross N.R. 5 × dwarf

F_1	Petal colour = Deep yellow		Habit of growth = Fully normal		
Classes in F_2	Yellow petal		White petal		Total
	Normal growth	Dwarf growth	Normal growth	Dwarf growth	
Frequency in F_2 (observed)	115	31	31	14	191
Frequency in F_2 (expected on 9:3:3:1)	107·4	35·8	35·8	11·9	190·6
Deviation	−7·6	−4·8	−4·8	−2·1	

9 : For 33 : 1 $X^2 = 2·19$ P between 0·70 and 0·50

TABLE IV

Behaviour of F_1 and F_2 of the cross B. XXI × dwarf

F_2	Sinus lobe = Absent		Habit of growth = Normal		
Classes in F_2	Sinus lobe absent		Sinus lobe present		Total
	Normal growth	Dwarf growth	Normal growth	Dwarf growth	
Frequency in F_2 (Observed)	108	42	35	12	197
Frequency in F_2 (expected on 9:3:3:1)	110·8	36·9	36·9	12·3	196·9
Deviation	−2·8	−5·1	−1·9	−0·3	

For 9 : 3 : 3 : 1 $X^2 = 0·88$ P between 0·90 and 0·80.

In respect of the above two crosses a good fit for the digenic ratio is observed.

From the results of the F_1 generation it is evident that the dwarf habit behaves as a recessive to the normal in both the crosses. In the cross N.R. 5 × dwarf (Table III) yellow petal of the dwarf is dominant to the white of N.R. 5. The F_2 behaviour of the petal colour and dwarf habit jointly give a 9:3:3:1 ratio indicating that the genes responsible for these characters are situated on different chromosomes.

I = Normal and dwarf plant.

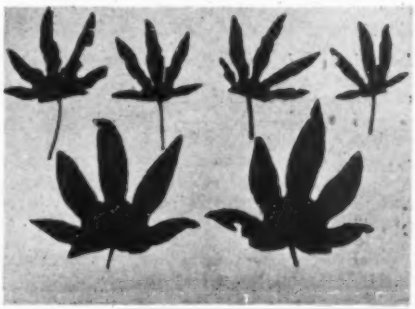
Left: Normal Plant.
Right: Dwarf Plant.

In the cross B. XXI × dwarf (Table IV) the absence of sinus lobes is dominant to its presence or that there is an inhibitor in the B.XXI parent which suppresses the expression of the lobe character in the F_1 generation. In F_2 generation the behaviour of sinus lobe and dwarf habit assort independently on a 9:3:3:1 basis indicating as in the first cross, that the genes controlling these characters lie on different chromosomes.

The genic symbols for the various characters have been assigned as below:—

Yellow petal = YY, White petal = yy.
Absence of Sinus lobe = SS, or II ss. Presence of sinus lobe = ss or ii ss.
Inhibitor = II.
Normal habit of growth = DD.
Dwarf habit of growth = dd.

It may be pointed out that all dwarf plants in the F_2 could be easily distinguished by their dwarf habit of growth, small leaves with wavy margins (Plate II) and small flowers. All such plants were self-sterile and, therefore, could not be grown further.



II = Leaves of dwarf plant with wavy margins. Leaves of normal plant.
Top Row: Leaves of Dwarf Plant.
Bottom Row: Leaves of Normal Plant.

The mutant plant described above resembles in certain respects the crinkled dwarf mutant, observed in barbadense (Sea Island) cotton and also recorded in Egyptian cotton under the name crinkled leaf by Trought and has been found in hirsutum cotton by Hutchinson and Ghose. The points of resemblance in the mutant and the crinkled dwarf are (1) the torn and ragged leaf edges and (2) its simple recessive behaviour in the inter-varietal crosses. The leaf-surface of this mutant is smooth and green as opposed to the crinkled and mosaic leaf-surface of the crinkled dwarf.[1]

I am highly thankful to the Indian Central Cotton Committee for having permitted me to publish this note and to Mr. V. V. Nimbkar for having helped me in taking the various observations in the field.

1. Harland, S. C., *The Genetics of Cotton*, 1939, p. 79.

ATOMIC RESEARCH IN GREAT BRITAIN

A NEW Atomic Energy Research Establishment is being set up at Harwell (Britain). This establishment will be concerned with the development of the scientific and industrial aspect of nuclear energy and with the solution of the scientific problems which will arise in the large-scale production of fissile materials. Physics, Chemistry, Engineering and Biological Laboratories form the main centres of activity in the new establishment. A low-power graphite file is under construction and will be in operation shortly. A high-powered graphite file is also under construction which, when completed, will provide intense sources of radiations and produce, on a large scale, radioactive substances for scientific research and for medical work. For studies in fundamental nuclear physics of importance to atomic energy, an electrostatic generator for the production of 5 million volts and a "92-inch" cyclotron are being built. The Research Establishment is being manned by the large number of British scientists who acquired essential experience in atomic energy development in North America.

The present scientific staff working on the Harwell Project is about 250 of whom 35 are actually working at Harwell.

LETTERS TO THE EDITOR

ON YOUNG'S MODULUS FOR INDIA RUBBER

It is generally made out that the dynamical value of the Young's modulus for India rubber is greater than the statical value E_1.[1] In some cases it is found that E is almost equal to E_1.[2] Various reasons have been put forward for explaining this discrepancy. It is found that Hooke's Law, which does not hold good for large values of the longitudinal stretch, is used for statical values. In experiments conducted with India rubber the stretch is not small, and hence the theory of Finite strain[3] should be used for determining the statical value.

If E′ be the value of the Young's modulus as given by the Finite strain theory, we find

$$E' = \frac{2\,l^2 w}{l^2 - l_1^2}, \quad E_1 = W\frac{l_1}{l - l_1} \qquad (1)$$

w being the weight hung and l and l_1 being the stretched and unstretched lengths of the specimen used. Thus

$$\frac{E'}{E_1} = \frac{l}{l_1} \cdot \frac{2l}{l + l_1} \qquad (2)$$

which shows that $E' > E_1$. In fact if $l = {}^3/_2\, l_1$, we get $E' = {}^9/_5\, E_1$, which is practically the dynamical value found in certain cases. Thus the mistake lies in using Hooke's Law.

If w, the weight per unit length of the specimen, is also to be taken into account, we get the result

$$\frac{lw}{E'} = \left(1 - \frac{2w}{E'}\right)^{\frac{1}{2}} - \left[1 - \frac{2}{E'}(l_1 w + W)\right]^{\frac{1}{2}}. \qquad (3)$$

Hindu College,
Delhi, B. R. Seth.
August 14, 1946.

1. Deodhar, G. B., and Kothari, D. S., *Ind. Journ. Phys.*, 1928, **2**, 305. 2. Puri, A. N., *Proc. Nat. Acad. Sci.*, 1937, **7**, 45. 3. Seth, B. R., *Phil. Trans. Roy. Soc.*, 1935, **234**, 231.

WHY LESS OZONE OVER EQUATORIAL LATITUDES[1]

The problem of lower temperature at the tropopause over the equator than in the temperate latitudes has again come into prominence.

In discussing the sounding balloon data of Agra, Ramanathan suggested that the lower temperature at the equatorial tropopause may be due to one of the two causes, the relevant one being strong convective action in the higher layers of the tropopause.[2] The strong convective action can arise if more moisture is present. He found, on an average, more water vapour at all levels of the troposphere in the tropics than in the temperate regions.

Dobson found during the war (1939-45) with the new Hygrometer devised by him that the amount of water vapour about the level of

tropopause and in the stratosphere to be only 1/50 that was expected from previous measurements. In a suggestive paper,[3] he explained the low temperature of the tropical tropopause by considering that the amount of ozone to be less and the amount of water vapour to be more in the tropics than in the temperate latitudes. But he finds no reason why the amount of ozone should be less over the tropics than elsewhere. To import a fresh cause for this decrease may not be necessary. The agencies involved are sun's ultra-violet rays (photochemical action) water vapour and ozone. It is well known that ozone breaks up (slowly, but more rapidly than in the absence of water) in presence of water or water vapour. In many chemical reactions water vapour plays the role of a catalyst.

It is suggested, as a possible solution that the smaller amount of ozone in the tropical air may be due, as a condition of equilibrium, to the excess water vapour itself in presence of ultra-violet light. Similarly in summer in India, when water vapour increases the ozone content may diminish.

Meteorological Office,
Poona, S. L. MALURKAR.
September 24, 1946.

1. Read before the Symposium of National Institute of Sciences, India, Bombay, August 30th, 1946. 2. *Memoirs Ind. Met. Dept.*, 1930, **25**, 183. 3. *P.R.S.*, Feb. 1946.—*Bakerian Lecture for* 1944.

THRESHOLD POTENTIAL, CONDUCTIVITY AND COURSE OF A CHEMICAL CHANGE UNDER ELECTRICAL DISCHARGE

TOWNSEND'S theory of ionisation by collision contemplates sensibly the same change on reaching the 'dielectric strength', 'starting', 'break-down' or the spark (Paschen) potential. For elementary gases, this is identifiable with, or is a simple function of the corresponding 'threshold potential' V_m in especially ozoniser type discharges.[1,2,3,4,5] Like Paschen potential, V_m is a sensibly linear function of the gas pressure. As found by the author for V_m[1,2,5] it is extremely likely that 'electron affinity' of the excited gas, besides its ionisation potential is a chief determinant of the Paschen potential; comparatively, however, V_m would appear to be more sensitive to change of frequency of A.C. supply and of temperature especially in polyatomic gases and reactive mixtures.

The author's general finding[1,2,3,4,5,6] that (i) a reaction occurs only above V_m and (ii) that at an applied potential V, velocity of the chemical change and the corresponding current i depend principally on $V-V_m$, has been confirmed by results of numerous discharge reactions studied in these Laboratories, including such quasi-chemical changes under discharge as the activation of nitrogen, its deactivation, 'latent image' formation, etc. (ii) led to the prediction and discovery by the author of a new *light-effect* Δi, an instantaneous and reversible photo-diminution of i observable from X-rays to extreme red in a number of gases and vapours under electrical discharge.[2,5,6]

In part, V_m corresponds to the 'energy of activation' found chiefly from the temperature coefficient, which is a distinctive characteristic of a thermal reaction. It does not enable an experimental separation of a composite chemical change, *e.g.*, into its consecutive reactions. This is possible, however, in a discharge reaction by excitation at V_m. It follows from (i) that near V_m the earliest of the (consecutive) reactions would set in with least velocity and minimum decomposition of its products. Excitation at V_m should, therefore, be, a valuable device for isolating (at any rate detecting) unstable, *e.g.*, intermediate products in a discharge reaction. This has been substantiated by results for the decomposition under silent discharge of some oxides of sulphur and nitrogen *per se*, and also in contact with metallic and certain reactive films, studied in these Laboratories.

The marked utility of data for the time-variation of i as a means of elucidating the course of a discharge reaction has been emphasised by the author.[1,2,5] It is about the only criterion of the progress of a reaction (*e.g.*, hydrogen, chlorine combination) unaccompanied by pressure change, without disturbing the system as with a time-to-time analysis of the reaction mixture. This last, gas pressure p, i and such associated characteristics as wattage W dissipated in the system, the spectral nature of the discharge glow, etc., show a greater mutual synchronous variation during the reaction, the nearer to V_m is the corresponding applied V. This, in general, would also favour observation of discontinuities characteristic of the course of the reaction, corresponding to consecutive changes.

Under certain conditions, decomposition of nitrogen dioxide and especially the nitrous oxide + hydrogen reaction under silent discharge, reveal a remarkable periodic effect[6,7] in respect of all variables mentioned above (p, i, W, etc.,); from this and (ii), the corresponding V_m should vary periodically; this has been observed. Whilst in general, *Ceteris paribus* excitation near V_m favours the production of this periodic effect, the time-variation of some of the above quantities is affected markedly by but small changes in $V-V_m$ near V_m.

In a Siemens' type discharge tube, the total capacity is determined chiefly by that associated with the annular space which is the seat of both ionisation and the reaction. In a theory[8,9] of the new *light-effect* Δi an assumption is made by the author of an 'electrode layer' derived from the ions and neutral molecules in the discharge space; and that under light *inter alia* a change of phase due to that of the capacity by the photoelectric emission leads to Δi. In the absence of light, an excited layer leading to such a capacitative change may well occur due to the surface activity of especially some of the reaction products. If this layer is deformed and in part restored intermittently, the periodic effect, as observed in i and the other associated quantities would follow. Such an electrode layer is anticipated to be stabler the lower the temperature of the system; this is shown by the marked reduction on cooling of the corresponding periodic effect.[6,7]

At V_m a part of the input energy is radiated in space chiefly as high frequency oscillations; their frequencies and the corresponding current ^{i}-aerial increase with V. This applies also to the ordinary circuit conductivity i consisting of $^iHF + {}^iLF + {}^iS$ being due to the frequency of the A.C. supply and its harmonics, ^iS would appear to constitute a minor part of *i*. From the possible capacitance-change during a chemical reaction as in the *light-effect* Δi suggested above, the time-variation of the filtered ^{i}-aerial, ^iHF, ^iLF, etc., should be synchronous with the stage-wise progress of the corresponding composite change, especially when produced near V_m. Results of periodic reactions now being investigated in these Laboratories are in close accord with this deduction.

Department of Chemistry,
Benares Hindu University, S. S. JOSHI.
October 5, 1946.

1. Joshi, *Trans. Faraday Soc.*, 1929, **25**, 127, 140. 2. —, *Curr. Sci.*, 1939, **8**, 548. 3. —, *Nature*, 1944, **154**, 147. 4. —, *Curr. Sci.*, 1944, **13**, 253. 5. —, *Proc. Indian Acad. Sci.*, 1945, **A22**, 389. 6. —, *Presi. Address Chem. Sec., Indian Sci. Cong.*, 1943. 7. Joshi, and Deshmukh, *Nature*, 1945, **155**, 483. 8. Joshi, Abst. **26**, *Phys. Sec.*, Indian Sci. Cong., 1946. 9, —, *Proc., Indian Acad. Sci.*, 1945, **A22**, 225.

ADSORPTION OF HYDROGEN AND CARBON MONOXIDE AND THEIR MIXTURES ON FISCHER-TROPSCH CATALYSTS : PART I

THE adsorption of hydrogen and carbon monoxide has been studied, both from pure gases and their mixtures on a kieselguhr supported catalyst containing 34·2 per cent. cobalt, 4·084 per cent. copper, 2·33 per cent. ThO_2 and 0·2369 per cent. Ce_2O_3 (tried in Fischer-Tropsch synthesis) at temperatures considerably below those where velocity of reaction becomes perceptible It was found that in the adsorption from mixtures, the presence of one gas promoted the adsorption of the other. The increase of adsorption was conspicuous even at 25° C. in the case of hydrogen and became noticeable only at 97° C. in the case of carbon monoxide. Besides, activation was found to set in at a much lower temperature in the case of mixture adsorption than in the case of pure gas adsorption. The relative amounts of the individual gases adsorbed from mixtures increased with rise of temperature even at temperatures above 25° for hydrogen and above 51° for carbon monoxide ; in the case of pure gases, this activation effect became appreciable only at much higher temperatures, *viz.*, above 97° C. for hydrogen and 134° C. for carbon monoxide.

The adsorption was measured by a volumetric method. The analyses were carried in a modified micro Bone and Wheeler apparatus. No trace of hydrocarbons was found in the adsorption system at temperatures below 110° C. even after a period of 24 hours which was considered necessary for attainment of adsorption equilibrium.

The enhancement of adsorption of one gas by another cannot be explained on the basis of Langmuir theory, extended to cover mixed adsorption by Markham and Benton.[1] The theory, on the other hand, leads to the conclusion that the adsorption of one gas should decrease the adsorption of the other as was found by Hurst and Rideal[2] in the adsorption

TABLE I.—*Hydrogen*

p	25° C.			51° C.			76° C.			97° C.			107° C.		155° C.
	P.G.	M_1	M_2	P.G.	M_1	M_2	P.G.	M_1	M_2	P.G.	M_1	M_2	M_1	M_2	P.G.
15	—	3·45	—	2·11	3·87	5·18	—	4·79	6·12	2·31	6·69	10·88	9·72	16·25	2·86
25	3·08	4·07	7·00	2·40	4·59	6·90	—	5·68	8·29	2·57	7·27	13·07	11·55	19·80	3·20
35	3·20	3·76	6·94	2·62	5·30	7·16	—	6·66	8·59	2·72	9·19	14·30	15·00	22·71	3·47
60	3·00	—	—	3·09	-	—	—	—	—	3·21	—	—	—	—	4·08

TABLE II.—*Carbon Monoxide*

p	25° C.			51° C.			76° C.			97° C.			107°C.		134°C.	155°C.	178°C.
	P.G.	M_1	M_2	P.G.	M_1	M_2	P.G.	M_1	M	P.G.	M_1	M_2	M_1	M_2	P.G.	P.G.	P.G.
15	9·58	6·50	3·36	7·36	6·43	3·43	7·10	6·95	4·21	7·10	8·34	6·49	10·30	10·39	7·36	9·60	14·78
25	10·93	7·35	3·97	8·44	6·75	—	8·06	7·40	—	8·00	9·00	—	11·86	—	8·18	10·92	17·69
35	11·98	9·85	—	9·44	7·79	—	9·19	8·13	—	8·91	10·75	—	15·10	—	9·25	12·25	20·50
60	14·20	—	—	11·10	—	—	—	—	—	11·15	—	—	—	—	11·91	16·12	26·40

p = partial pressure in cms. of mercury, P. G = volume in c c. N.T P. adsorbed by 9·41 gms. of catalyst from pure gas, M_1 = volume adsorbed from C 1 : 1) CO : H_2 mixture and M_2 = volume adsorbed from (1 : 2) CO : H_2 mixture.

of a mixture of carbon monoxide and hydrogen by copper, and by Markham and Benton in the adsorption of a mixture of carbon monoxide and oxygen by silica at 0° C.

It might be mentioned in this connection that Griffin[3] has shown that the presence of a small quantity of carbon monoxide on copper increases the amount of hydrogen adsorbed at low pressures and decreases it at high pressures. Markham and Benton[1] themselves have seen in the adsorption of a mixture of carbon monoxide and carbon dioxide on silica at 100° C. that the amounts of carbon monoxide adsorbed at high partial pressures of carbon dioxide are greater than the amounts adsorbed in its absence and *vice versa*. Further, Lambert and Heaven[4] have found that oxygen and argon mutually increase each other's adsorption on silica gel at 0° C.

Fuller details of the observations reported here will soon be published elsewhere. The investigation is being continued with other gases and catalysts of technical importance.

J. C. Ghosh.
M. V. C. Sastri
K. A. Kini.

General Chemistry Section,
Dept. of Pure & Applied Chemistry,
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Bangalore,
October 15, 1946.

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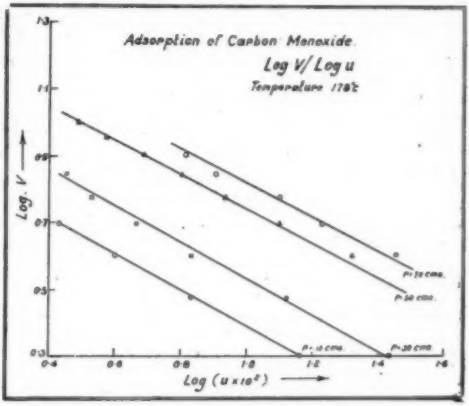
ADSORPTION OF HYDROGEN AND CARBON MONOXIDE ON FISCHER-TROPSCH CATALYSTS : PART II.

The rate of adsorption of hydrogen and carbon monoxide was studied on the catalyst containing 34·2 per cent. cobalt, 4·084 per cent copper, 2·33 per cent. ThO_2 and 0·2369 per cent. Ce_2O_3. It was found that the Langmuir equation[1] did not hold. This is to be expected because the Langmuir equation is valid only for adsorption on a uniform shrface. The Bangham and Sever formula,[2] $\log \frac{\sigma}{\sigma - s} = kt^{1/m}$ where σ = saturation value of adsorption s = adsorption at any time t, and k and m are constants, required very high values for σ to give straight lines when $\log \left(\log \frac{\sigma}{\sigma - s}\right)$ was plotted against $\log t$. On the other hand, it was found that the logarithms of the values for the rate of adsorption at constant pressure, when plotted against the logarithms of the corresponding volumes adsorbed, gave straight lines, which for different pressures and a particular temperature were all parallel as could be seen from the graph shown in Fig. 1 for carbon monoxide at 178° C. Similar graphs were obtained at other temperatures and also for hydrogen.



The results of the present investigation suggest the following empirical relationship between the rate of absorption, the pressure and the amount of adsorption,

$$u = k \frac{P}{V^n}$$

where u = rate of adsorption in c.c./min., P = pressure and V = volume adsorbed, n and k are constants.

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1. *J. Amer. Chem. Soc.*, 1918. **40**, 1361. 2. *Phil. Mag.*, 1925, **49**, 935.

INFLUENCE OF CARCINOGENS ON YEAST

Several polyploidogenic organic compounds, *e.g.*, camphor, colchicine, acenaphthene and other related derivatives, have been employed to produce cells with chromosome complements several times higher than the normal. Treatment with camphor, after the first dosage has been found to induce in the cells of *Saccharomyces cerevisiæ*, a strain of brewery yeast, an increase in their volume to about twice that of the normal; a second treatment was found to result in a supergigas race with thrice the volume of the normal.[1]

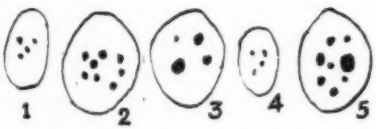
The present work has been undertaken to determine the effect of a few of the available carcinogens, fluorene, fluoranthene, retene and chrysene, on a strain of industrially important distillery yeast (N.C.T.C. 3019). Alcoholic solutions of these compounds (5 mg./ml.) were employed; in the case of the sparingly soluble chrysene, the solution attained saturation since

a portion of the substance remained undissolved. The retene solution was slightly yellowish; that of chrysene exhibited a slight pinkish fluorescence; other solutions were colourless.

The yeast which has a high tolerance of alcohol was plated out on wort agar and the alcoholic solution of the carcinogen (0·5 ml.) was placed in cups equidistantly placed in the plate; one of the petri-dishes received only the pure solvent, absolute alcohol. The method employed was very similar to the familiar "Cup assay" technique now extensively used in the assay of antibiotics.

The colonies developed after five days' incubation at room temperature (23-24° C.) were examined under the microscope for size and cell inclusions. Smears were fixed in carnoy and stained with toluidine blue in accordance with a reproducible schedule standardised in these laboratories. Examination of the permanent slides revealed that retene-treated yeasts showed a significantly high accumulation of nuclear material; this phenomenon was clearly observable, if to a smaller extent, in the case of chrysene-treated cells.

Organisms once treated were respectively subjected to a second dosage of the same chemical, employing the "Cup assay" technique. After five days' incubation at room temperature, the organisms were examined in the same way as described above. The retene-treated cells, to the extent of about 25 per cent. were found to contain, large-sized heavily stained bodies; fluoranthene-treated cells showed a similar effect but to a less pronounced extent. Fluorene-treated cells did not show any effect. Chrysene-treated organisms, on the other hand, attained a large size (twice that of the normal) and became endowed with heavily stainable nuclear bodies; the number and size of these bodies in the cell increased (see Fig. 1). These cells after plating on wort



1. Alcohol. 2. Retene. 3. Fluoranthene.
4. Fluorene. 5. Chrysene.

agar, gave rise to cells which retain the same characteristics as regards cell inclusions. The biochemical performance, that is, the alcohol-producing capacity of these treated strains of yeasts, are now being investigated.

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October 8, 1946.

* Supplied three of the carcinogens employed in these investigations.

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PITH IN SUGARCANE

The central core of the stems of dicotyledonous plants, known as 'medulla' or 'pith', is composed of parenchymatous tissue surrounded by a ring of vascular bundles and serves as the place of storage of reserve food materials like starch. Monocots, however, do not contain a well-defined pith since the vascular bundles are not disposed in the form of a ring but are scattered throughout the ground tissue. In sugarcane the term pith is used in a special sense and connotes the chalky white opaque tissue which develops longitudinally in the centre of the stem. It generally consists of parenchymatous cells and sometimes includes a few of the centrally situated vascular bundles also. Depending upon the variety, development of pith commences even when the canes are six or seven months old. The formation of this tissue is followed, after some time, by death and at times disintegration of the constituent cells later on, resulting in the development of a longitudinal hollow. Thus pith formation in sugarcane reduces the storage tissue and consequently the tonnage and yield of sugar. Hence it is a very undesirable character in any cane variety. An attempt was, therefore, made to quantitatively estimate the amount of pith in some sugarcane varieties at the Agricultural Research Station, Anakapalle during 1943-44 and 1944-45, and the results of the latter year are summarised in this short note.

From a ratoon experiment including four varieties (co. 419, co. 421, co. 523 and co. 527) and three treatments (plant crop first ratoon and second ratoon) samples were taken for purposes of this study. Twenty canes, in all, were selected at random from each treatment and variety. This was a composite sample and canes from each subplot were not separately studied. Each cane was cut at the centre of every internode giving a number of cane pieces, each of which had a node at the centre and two halves of internodes on its either side. The diameters of the top cut end (that half, which had the bud) of each cane bit and that of the pith visible at its surface were measured in two directions. The diameter of the internode and that of the pith was arrived at by averaging the two values (obtained by measuring the diameter in two ways, across and along the bud). The volumes of the different internodes and the pith in the same were calculated by applying the formula $\pi r^2 L$ where L was the length of the top internode. (It was assumed that (1) the internode was cylindrical and (2) the pithy core had a uniform volume throughout any particular internode.) In each case the volume of pith was expressed as a percentage of the volume of the entire cane.

The conclusions from the summarised data presented in the tables, appended separately, are as follows:—

In the varieties under study co. 523 had the highest amount of pith (17·22 per cent. pith to total volume of cane) followed by co. 527 (10·74 per cent.), co. 421 (8·56 per cent.) and co. 419 (3·66 per cent.) in the order of mention. The differences between the percentage volumes of pith in the four varieties were statistically significant. (2) Among treatments,

'second ratoon' recorded the maximum per cent. volume pith and was statistically on par with plant crop. (3) Arrowed canes contained more pith than unarrowed canes in any variety and treatment.

Further investigations to determine the actual loss in tonnage due to formation of pith, when the crop is kept for long on the field, are in progress.

TABLE I

Per cent. Volume of Pith to Total Volume of Cane

Varieties		*Treatments*	
Co. 523	17·22	Second ratoon	10·58
Co. 527	10·74	Plant Crop	10·43
Co. 421	8·56	First ratoon	9·12
Co. 419	3·66		
Critical difference P = 0·05	1·37	Critical difference P = 0·05	1·19

TABLE II

Percentage Volume of Pith in Arrowed and Unarrowed Canes

Variety	Plant crop.		First ratoon		Second ratoon	
	Arrowed canes.	Unarrowed canes.	Arrowed canes	Unarrowed canes	Arrowed canes	Unarrowed canes
Co. 419	7·45	2·25	8·35	1·59	10·51	0·68
Co. 421	12·13	6·73	8·27	6·70	10·31	8·92
Co. 523	22·40	17·32	18·66	13·05	21·09	15·37
Co. 527	11·30	7·08	10·53	10·74	12·81	9·51

Agricultural Research Station,
Anakapalle, M. LAKSHMIKANTHAM.
September 23, 1946.

CONCENTRATION OF GRAPHITES BY FROTH FLOTATION

THERE are two types of impurities met with in graphite. One is the inherent ash which is present probably in molecular association with the carbon and is almost impossible to dislodge and concentrate the ore by any device. But the more frequent impurity which brings down the assay value of the sample is the extraneous mineral matter in fine grains which can be removed by physico-chemical methods such as flotation.

Venkateswarlu[1] tried bulk oil flotation on some Indian graphites. Except for this, in the available literature no systematic examination appears to have been carried out on Indian graphites. The Bureau of Mines, U.S.A.,[2] has worked out flotation processes for the concentration of very low grade oxidised and unoxidised graphite ores from Alabama, New York, assaying 5-10 per cent. graphitic carbon. Enrichment to 90 per cent. carbon with 70-80 per cent. recovery has been shown to be possible.

A considerable quantity of unoxidised graphite ore is mined in some localities in West Godavary District and in the contiguous parts of the Nizam's Dominions. The better grades are exported and the inferior ones used for making crude graphite crucibles at Rajahmundry. In one plant some concentration is achieved in water tanks by sedimentation of the impurities. A good part of the graphite mined which assays less than 55 per cent. carbon, is at present being discarded. This loss obviously is preventable.

The general principles of flotation are well understood in the graphite industry but successful commercial exploitation requires a detailed study of the local factors such as particle size, and pH of the natural pulp, conditioning required, the chemical composition of the mineral matter and the method of flotation to be employed.

For this preliminary investigation samples of graphites from the Godavary and Vizagapatam districts have been employed. A single stage froth flotation using pine oil was carried out in an apparatus designed for the purpose and constructed out of material commonly available in the laboratory.

The apparatus consists of a sintered glass funnel, the stem of which is passed through that of a large-sized ordinary funnel and fixed by means of a cork. The outer funnel serves to collect the overflowing froth. Air from a compressor is fed into the sintered funnel through an orifice-meter and constancy of flow is assured by means of a cock in the line. The air is well distributed in the system.

The ground ore (30 gm.) passing through 50-mesh was pulped with water (150 c.c.) and treated with pine oil (0·2 c.c.). The pulp was placed on the sintered bed and aeration started. The frothing was complete in about 12 minutes. The froth and the gangue were separately filtered, dried and weighed. Carbon percentages were determined on the crude as well as the froth and gangue by the wet oxidation method.[3] The results are recorded below:—

District	Sample No.	Carbon %			Recovery %
		crude	froth	gangue	
West Godavary	1	69·1	80·4	42·6	70·1
,,	2	26·4	58·2	18·1	20·7
,,	3	17·6	52·6	12·1	13·6
East Godavary	4	41·3	74·2	28·0	28·8
,,	5	32·1	64·1	26·9	14·0
Vizagapatam	6	14·2	36·3	9·8	16·6

It is clear that in all cases appreciable enrichment occurs even with an unconditioned coarse pulp in a single stage froth flotation in a simple apparatus. The results are encouraging as regards enrichment, but except in one case the recoveries are poor. Further investigation is necessary and is being taken up.

The authors wish to thank Dr. K. Neelakantam for his kind interest in this work.

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September 26, 1946.

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MILK OF HE-GOAT

RECENTLY I have come across an instance of a he-goat giving milk from both the teats since last November. The maximum amount secreted was 6-7 oz., but this has considerably decreased and the output to-date is only ¾ oz. The goat behaves quite normally in other respects and is used for stud.

Two samples of this milk were collected and analysed. The average of these two determinations were: Fat (Gerber) 4·6 per cent.; Total solids (gravimetric) 14·4 per cent.; Solids-not-fat 9·8 per cent. This milk seems to be normal compared to the average figures reported for the milk of she-goat.

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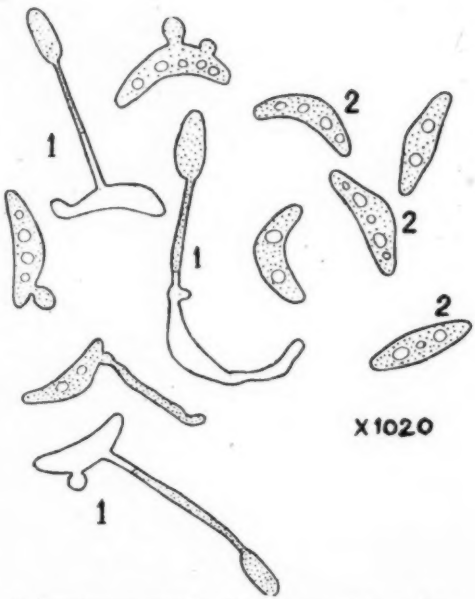
A NOTE ON THE OCCURRENCE OF *SPHACELIA* ON *CENCHRUS CELIARIS*

OCCURRENCE of the genus *Claviceps* in India has been recorded by various workers on different hosts. McRae (1917) described *S. sorghi* on *sorghum* in Madras Province. Ajrekar (1926) has recorded the same fungus and also Sphacelia on *Dichanthum nodosum*, *Dichanthium annulatum*, *Pennisetum Hohenækeri* and *Ischæmum pilosum* in Bombay Province. Ramakrishnan (1937) has recorded Sphacelia on *Panicum ramosum* from Coimbatore. Thirumalachar (1943) has observed a *Claviceps* on sugarcane in Mysore and Sphacelia on *Digitaria longifolia*, *Symbopogon cæsium* and *Heteropogon contortus* in 1945. Thomas and others (1945) have published a list of grasses on which occurrence of Sphacelia has been observed by them. This list comprises twenty-one grasses of common occurrence in South India.

At Coimbatore a Sphacelia has been observed by the writer, to occur on *Cenchrus celiaris*, a common fodder grass of South India. The grass has not been included in the list of hosts of the fungus so far published. The description of the fungus is given below:

Conidia are formed in light yellowish drops of viscous 'honey dew', which later on dry up into an yellow gummy mass. Conidia are hyaline, falcate or sickle-shaped with more or less pointed ends, one-celled with 2 to 6 conspicuous vacuoles and measuring 18·37 × 5·96 μ, the



1. Germinating conidia with the germ tube and the secondary conidia at the tip.
2. Conidia.

Sphacelia on *Cenhus celians*
Left-Single Flower. Right Affected panicle

range being 14·0-25·2 × 5·0-8·4 μ. The conidia readily germinate in water producing an oval secondary conidia at the tip of the germ tube.

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September 20, 1946.

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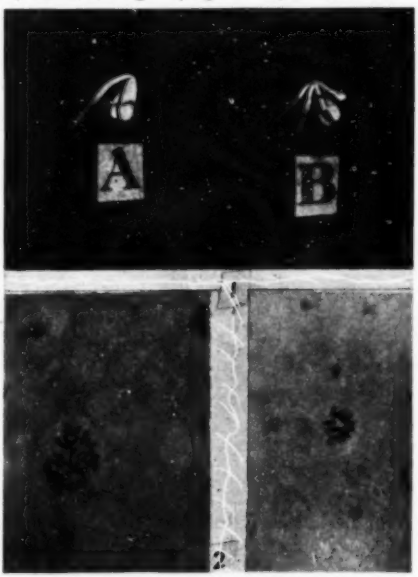
HAPLOID-HAPLOID POLYEMBRYONY IN *SESBANIA ACULEATA* PERS.

WHILE germinating the seeds of *Sesbania aculeata* Pers. for chromosome studies, the author observed one seed with two radicles. Dissection of this seed showed the presence of two seedlings (Fig. 1 B). One of the



FIGS. 1-3. *Sesbania aculeata* Pers. Fig. 1. A, a normal seedling, B, twin seedlings. Fig. 2. Root tip of normal seedling, showing 24 somatic chromosomes. Fig. 3. Root tip of one of the twin seedlings showing 12 chromosomes.

twin seedlings was bigger and from its size resembled a normal seedling. The other was comparatively smaller in the size of its cotyledons, but possessed a normal radicle and plumule. The dissection further showed that it was a case of multiple seedlings of the conjoined type as no direct morphological attachment existed between the twins.

To investigate the nature of each of the twins, root-tip sections were obtained. For the sake of comparison, sections were also obtained from normal root tips. The root-tips from normal seedlings showed 24 chromosomes (Fig. 2), while the chromosome number in root-tips of both the members of the polyembryonous seed was 12 only (Fig. 3). This clearly shows that it is a case of haploid-haploid polyembryony. Ordinarily whenever there are two embryos in one seed, one embryo shows the normal diploid member. The other may be either haploid, triploid or tetraploid. The haploid-haploid polyembryony is of very rare occurrence and only a few cases have been reported such as *Asparagus officinalis* L. (Randel and Rick, 1945) and *Gossypium barbadense* (Webber, 1940).

Nothing can be said with certainty about the origin of this case of haploid-haploid polyembryony. Ramiah, Parthasarathy and Ramanujam (1933) from their study of haploid-diploid twins in *Oryza sativa* believed that the haploid embryo originated parthenogenetically from a synergid or an antipodal. Later on (1935) they suggested that formation of more than one embryo-sac within a single ovule of *O. sativa* may result in the origin of polyembryony. Harland (1936) with regard to *Gossypium barbadense* and *G. hirsutum* says that polyembryony here involves the production of extra embryo-sacs. Cooper (1943) suggests that many of the haploid plants seen to-day have originated from embryos arising from synergids. It is quite possible in this case, that both the haploid embryos have originated from the same embryo-sac parthenogenetically from two of the cells of the embryo-sac.

This case of poly-embryony in *S. aculeata* Pers. helps to explain the discrepancy between the different chromosome numbers reported for this species by the present author (1946) and Rao (1946). According to present author the chromosome number for this species is $2n = 24$ and $n = 12$, while Rao reports $2n = 12$. It is very probable that the plants studied by Mr. Rao were haploid.

I am thankful to Dr. A. C. Joshi for his kind criticism and to the late Dr. V. K. Badami for guidance during the investigation.

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September 10, 1946.

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A NOTE ON THE OCCURRENCE OF *PTEROSAURIA* IN INDIA

WHILE working in the eastern part of the Kotah State in January 1944, near the village Sirolkhal, a boulder was found which, on breaking yielded a very nice fossil jaw of a reptile.

After a detailed study as far as is possible in this country, it has been provisionally assigned to the order pterossauria, commonly known as the flying reptiles. The specimen is now being sent to the British Museum for a detailed generic and specific identification. The works of Lydekkar, Mately and L. Rama Rao have revealed the general presence of the reptiles of the orders of Dinosauris and Ichthiosaurs.

The boulder occurs in a formation which overlies the Vindhyans and which in its turn is overlain by the Trap flows. The rocks are highly arenaceous and silicified shales, deposited under the laccustrine conditions. In the field this is infra rap in position. But, however, owing to the abundance of Physaprinsepii; a conspicuous genera of inter-trappeans, the possibility of its being of inter-trappean age too cannot be ruled out.

Description.—The length of the jaw is 7·4 cms. After 2·4 cms., there is a notch from where it is projected onwards in a beak-like form. There are five sockets in the jaw, three of which contain teeth, and two are marked by the impressions only. Out of these three, one is fully preserved and the other two are not in a good order of preservation. As the teeth are not well preserved, hence it is very difficult to suggest as to whether the size of the teeth were in a decreasing or increasing order, and to which portion of the jaw the specimen belongs. The sockets are quite close to each other, and the teeth are placed at the margin of the jaw. The teeth are slender, conical and blunt at the apex. The closeness of the sockets suggest that animal must be having a large number of the teeth.

Measurement of the Jaw:—(1) Measurement of the jaw—7·4 cms.; (2) Length of the gum at the anterior end after 2·4 cms.—·3 cm.: (3) Breadth of the jaw at the posterior end—1·4 cm.

Measurement of the Gum:—(4) Breadth of the gum—1·4 cm.; (5) Length of the gum in the specimen containing three teeth—4 cms.; (6) Breadth of the gum at the distal end—1·6 cms.; (7) Height of the tooth—1·6 cms.; (8) Crown of the tooth—·6 cm.

Measurement of the Sockets at the base of the Crown:—(9) Major axis—·5 cm.; (10) Minor axis—·3 cm.

The nature of the teeth as described above resembles closely with the teeth of the flying reptiles or Pterosauria, the teeth of this animal when present are slender, conical and placed at the apex. They are insectivore, that is, live upon the animals.
(Zitel v.part II p.o.)

Discussion.—The blunt apex and other features suggest that the animal must not have been carnivore or herbivore, but was as insectivore. As usually found that in the case of the former, i.e., in carnivores they are sharp and pointed, while in the case of the latter they are complex.

This group of the reptile is reported from a number of places in Europe, Africa and North America from rocks ranging in age from lower Jurrasic to Upper Cretaceous. The Pterossauria which appeared in Lower Jurassic reached to its climax during the Upper Cretaceous, and have also been reported from Brazil and Africa. As it is assumed that the land connection during the Upper Cretaceous existed between these countries and India, hence there is every possibility of their migration and existence over here. Prof. Von Huene who had made a study of the dinosaurian remains of India also remarked, "The dinosaur of India are closely allied to those occurring in the cretaceous of Madagascar and also with those of Patogonia and Brazil". This may also be taken as a support to the migration of Pterossauria in India.

Conclusion.—From the nature of the teeth and the association of the rocks, i.e., the remains of the Pterossauria are usually met with in estuarine and marine rocks and sometimes in the lacustrine too, we are thus inclined to assign it provisionally to the order *Pterosauria*.

Acknowledgment.—We are thankful to Dr. Raj Nath, Head of the Department of Geology, Benares Hindu University, for his keen interest in the work, and to Mr. I. P. Thapliyal, for his helpful discussions.

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REFRACTIVE INDEX AND REFRACTIVE CONSTANT OF MILK LOW IN SOLIDS-NOT-FAT

THE method of estimation and the limits of the refractive index and refractive constant, K, of milk were indicated in an earlier note.[1] Elsdon and Stubbs[2] pointed out that the refractive index of milk-serum fails as an infallible criterion of the purity of milk because the constant varies more or less with the solids-not-fat (S.N.F.) content of milk; and samples with low S.N.F. have usually an R.I. below the normal. This fact has the disadvantage of giving the benefit of doubt to all samples with low R.I., although the value might have been lowered artificially.

A similar relationship between the R.I. of *milk* and the S.N.F. also holds good, after a fashion, as shown in the following table and the accompanying figure which includes samples with S.N.F. below 8·5 per cent.

Relationship between certain constants of milk low in S.N.F.

Density (20°C.)	S. N. F. %	R. I. (40°C.)	K
		Cow Milk	
1·0272	8·38	1·3457	0·2070
47	7·97	50	72
48	8·14	50	72
73	8·22	49	67
55	8·23	54	72
69	8·30	50	68
73	8·28	55	70
81	8·30	50	65
15	7·36	43	75
50	8·29	51	72
80	8·43	56	68
62	8·32	57	72
55	8·04	54	73
73	8·28	53	69
		Buffalo Milk	
60	8·31	65	78
85	8·04	78	82
44	8·13	63	80
40	8·19	67	83

Fig. 1 illustrates clearly the fact that gross differences in S.N.F. are reflected in R.I. also.

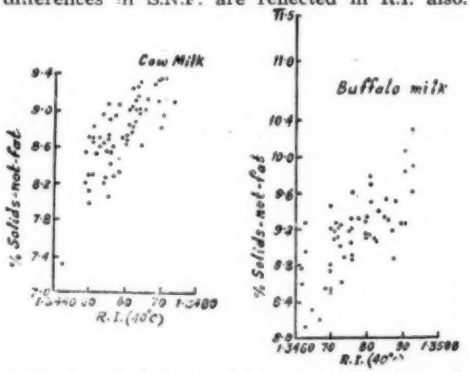

FIG. 1. Relationship between Solids-not-fat and Refractive Index of Milk.

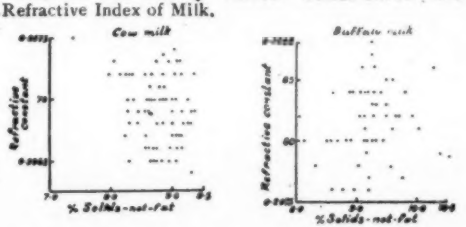

FIG. 2. Relationship between Solids-not-fat and K in Cow and Buffalo milk.

The refractive constant, however, is free from this disadvantage. As can be seen in Fig. 2 and the table, K bears no relationship to the S.N.F. constant of milk. For all values of S.N.F. of genuine milk, K lies between 0·2065 and 0·2075 for cow milk, and between 0·2076 and 0·2088 for buffalo milk. A noteworthy feature is that samples with low S.N.F. are found to be usually associated with low R.I. and values of K considerably above the minimum for normal milk. It may be possible that this is a feature, more or less, characteristic of samples abnormally low in S.N.F. On the other hand, attempts to lower the S.N.F. by addition of water only succeed in bringing down the values of both R.I. and K, which must, therefore, be viewed always in conjunction with each other. Added water thus begins to reveal itself at levels of about 10 per cent. addition.

The complete paper on the subject will be published elsewhere.

My thanks are due to Mr. B. N. Banerjee and Prof. V. Subrahmanyan for their kind interest in these studies.

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October 7, 1946.

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EFFECTS OF PENICILLIN ON BONE PHOSPHATASE

SILVER AND GOLDING[1] have reported that sulphonamide drugs which are commonly introduced in high concentrations at the site of fracture inhibit bone phosphatase. There is accumulating evidence[2,3] that the phosphatase of bone plays an essential role in normal bone formation and probably also in bone repair. We decided to study the action of penicillin on bone phosphatase as this drug is extensively used either alone or in combination with sulphonamides in fractures and other bone diseases. Observations were made *in vitro*.

CHEMICAL METHODS

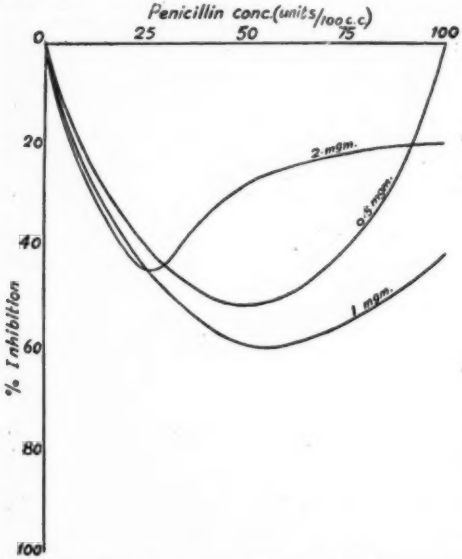
The bone phosphatase was prepared from young growing rabbit's bone by the method of Mortland and Robinson.[4] Phosphatase activity was determined by the method of Binkley, Shank and Hoagland.[5] It consists of incubating disodium phenyl phosphate and veronal buffer at pH 9·2 with phosphatase. Phenol which is split off, is determined colorimetrically by the blue colour given with the Folin-Ciocalteu reagent using the Klett-Sommerson photoelectric colorimeter. Tyrosine was used as a convenient standard and the phosphatase activity expressed in tyrosine units. Penicillin was added to produce concentrations comparable to those that might be present in wounds instilled with this drug. The concentrations of penicillin used were from 25 units per 100 c.c. to 100 units per 100 c.c.

The phosphatase concentrations employed in the reaction mixture were from ½ mg. per 10 c.c. to 2 mg. per 10 c.c. It was also found that commercial samples of penicillin gave a

blue colour with Folin-Ciocalteu reagent and had no action on the substrate alone. Although penicillin did not have the maximum stability at pH 9·2, it retained 70 to 80 per cent. of its potency for a period of 10 hours[6], at that pH.

RESULTS OF *in vitro* EXPERIMENTS

The results are illustrated graphically in Fig. 1.



1. *Enzyme* ¼ *mg. per* 10 c.c.—The concentrations of penicillin employed were 25, 50 and 100 units per 100 c.c. The maximum inhibition of the enzyme was caused by a concentration of 50 units per 100 c.c. of penicillin. The inhibiting action rapidly increased at first so that with 25 units per 100 c.c. the inhibition was 39·5 per cent., with 50 units per 100 c.c. It was 51·96 per cent. and then there was a sudden decrease and no inhibiting action was produced with the penicillin concentration of 100 units per 100 c.c.

2. *Enzyme* 1 *mg. per* 10 c.c.—Here also the inhibiting action rapidly increased so that with 25 units per 100 c.c. the inhibition was 43·38 per cent., with 50 units per 100 c.c. it was 59·82 per cent. and then there was a gradual decrease of inhibiting action.

3. *Enzyme* 2 *mg. per* 10 c.c.—There was a peculiarity in the behaviour of the enzyme. The inhibiting action rapidly increased at first, so that with 25 units per 100 c.c. the inhibition was 44·12 per cent., with 50 units per 100 c.c. the inhibition was 27·96 per cent. and with 100 units per 100 c.c. it was 20·54 per cent.

The results show that penicillin in the maximal concentrations that can be produced in the tissues does not significantly inhibit bone phosphates. On the other hand, a marked inhibiting action is noticed with lower concentrations of penicillin. The peculiarity exhibited by higher concentrations of the enzyme on penicillin could be explained by the protective action exerted by the enzyme at those concentrations.

Pharmacology Section, Indian Institute of Science, Bangalore, *October* 16, 1946

S. NATARAJAN.
N. N. DE.

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LOSS OF NITROGEN FROM SEWAGE

THE major part of the nitrogen present in food materials ultimately finds its way into sewage. The daily discharge of sewage from the major cities of India, with an aggregate population of about 45 millions, may be estimated to be about 450 million gallons and this would contain roughly 90 tons of nitrogen in combination. This, in turn, would be equivalent to 425 tons of ammonium sulphate per day or 1,54,760 tons per annum. If similar discharges from the smaller towns and major villages are included, the total equivalent of nitrogen would be considerably more. The aggregate amount of nitrogen would thus be considerably more than the amount of the synthetic fertiliser proposed to be manufactured in the country.

In our earlier communications,[1–3] we have drawn attention to the loss of nitrogen from Indian soils. Even nitrogen fixed from the atmosphere is not stable and is steadily lost.[4,5] We have observed that nitrogen of sewage is also rapidly lost. The loss occurs under all conditions—aerobic, semi-aerobic and anaerobic—though the extent of loss is variable and seems to be at a minimum under controlled aerobic conditions. It takes place in treatment tanks, during land irrigation and during sewage farming. During intensive aeration, there is an initial conservation as observed by Fowler and associates[6]; but when the aeration is prolonged, there is steady loss of total nitrogen (over 75 per cent.). Under anaerobic conditions, represented by the septic tank, a very large part of the nitrogen occurs as free and saline ammonia and this is rapidly lost on exposure to air. Similar changes occur during land filtration, the sewage being largely septicised before reaching the beds. There is also heavy loss of nitrogen during sewage farming. The soil accumulates very little nitrogen even after several years of farming. The loss is quite heavy, even allowing for the removal of nitrogen in the form of crops. The following results illustrate the position in regard to three farms (Table I).

TABLE I

Nitrogen contents of soils under sewage for varying periods

	Calculated quantity of sewage nitrogen (N) applied to soil per acre in lbs.	Calculated quantity of nitrogen removed by grass in lbs.	Nitrogen retained in the soil as determined by analysis (in mgm. per 100 gm. of air-dry soil, taken from 0–9")	Quantity of nitrogen retained in the soil per acre as calculated from the analytical* figures in lbs.	Calculated loss of nitrogen per acre in lbs. rounded		The loss of nitrogen from sewage in terms of ammonium sulphate per acre in lbs. rounded	
					During the whole period	Per annum	During the whole period	Per annum
Madura Sewage Farm								
(*a*) Virgin soil from the area adjoining the Madura Sewage Farm	Nil	Nil	47·8	..	..	..	..	..
(*b*) Under sewage for 18 years	64,800	18,000	97·2	894	46,000	2 600	2 16,000	12,000
Bangalore Sewage Farm								
(*a*) Virgin soil from the area adjoining the Govt. Sewage Farm	Nil	Nil	24·4	..	..	..	..	..
(*b*) Under sewage for about 25 years	90,000	25,000	58·2	676	64,000	2,600	3,03,000	12,000
Experimental Plots at the Institute								
(*a*) Virgin soil from the area adjoining the Sewag Fearm	Nil	Nil	87·9	..	..	..	..	..
(*b*) Under sewage for 2½ years	9,000	2,500	107·1	384	6.000	2,400	29,000	12,000

* Taking one acre as being equivalent to 2 million pounds of soil.

The figures given in the above table, excepting the analytical data, represent approximate calculations. The farms referred to receive a minimum of 15,000 gallons of sewage per acre per day. This would correspond to 3,600 lbs. of nitrogen per acre per annum. Allowing for a maximum cropping of 120 tons of grass per annum (which has not been possible under the conditions at Bangalore), the nitrogen thus removed would correspond to 1,000 lbs. The total nitrogen removed in drainage would approximate to 500 lbs. The major part of the remaining nitrogen is lost.

The loss goes on with continued day-to-day application to soil. Even in the absence of drainage and crops, there is steady loss as may be seen from repeated application at four-day intervals. The added nitrogen should have contributed 32 mgm. per 100 gm. of soil at the end of 24 days, but actually it was found to be only 5 mgm. per 100 gm. There was a tendency for the nitrogen level to remain stationary after the first fortnight, thereby showing that, under normal conditions, the rate of destruction tends to increase.

We have found that the major part of the nitrogen is lost in the form of ammonia. This occurs most rapidly when septicised sewage is spread over the soil on a warm day. If this loss could be prevented or, at any rate, the nitrogen made fully available to the immediate crop, there will be greater return in the form of plant food.

If the ammonia could be neutralised in some simple and automatic manner, there will naturally be less rapid loss from the soil. An alternative would be to ensure the presence of a dense vegetation that will continuously utilise the nitrogen of the sewage. Fodder and forage crops, as also leafy vegetables, respond best to sewage, but even these could not utilise all the nitrogen. There will be greater economy—without sacrifice of yield—if the same crops could receive diluted sewage. At least double the area could also be brought under sewage farming and the loss of nitrogen could be considerably reduced. If all the three steps, *viz.*, neutralisation of ammonia, dilution and a dense leaf crop could be combined, the loss could then be further reduced.

If the sewage is to be subjected to any pretreatment, then the most efficient system would be to intensely aerate and then to remove the sludge. The sludge would conserve the maximum amount of nitrogen and if it can be dried without reverting, then nitrogen loss will be at a minimum. The effluent will then contain only a small fraction of the total nitrogen. In this respect, the Activated Sludge Process is the most attractive among those so far devised.

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September 18, 1946.

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REVIEWS

Notes on Microscopical Technique for Zoologists. By C. F. A: Pantin. (Cambridge University Press), 1946. Pp. viii + 1-73. 6*Sh.* net.

There are many books available for guidance in microscopical technique but most of these, while exceedingly helpful to the experienced student, are often confusing to the beginner. A large variety of techniques is often described without judicious emphasis on whether a procedure is best suited for routine or for research on specific problems. This was largely the result of the high standard of scholarship maintained in the first and subsequent editions of Bolles Lee's *Microtomist's Vade Mecum* which was the precursor of many similar publications. The present book gives an account of methods found most satisfactory at the Zoological Laboratory, Cambridge, during the course of routine instruction and research.

The book is divided into a section describing the general methods of observation for living objects, fixation, sectioning, staining and reconstruction and another devoted to special methods for the demonstration of nerve cells. cytoplasmic inclusions and other specific constituents. This is followed by an appendix giving methods of preparation of saline media and cultivation of organisms. A very commendable feature is the emphasis given throughout these notes to the Chemical and Physiological principles on which the different methods are based. Most of these have been brought up-to-date and the improvements in microscopical technique effected by British workers in recent times have been incorporated. The descriptions given are brief and lucid. In a work of this kind one is bound to feel that something or other might have been added with advantage to those already included but this is no fault of the author who was confronted with choosing a few successful methods from a large number for the special benefit of students and those starting research in Zoology.

Pantin's book deserves a place in every laboratory bench where its frequent use as a guide for microscopical work seems assured.

N. K. PANIKKAR.

THE B.D.H. Book of Organic Reagents. (Ninth and Enlarged Edition.) (The British Drug House, Ltd., Graham Street, London N-1.) Pp. 196. Price 4/6.

With the development of the utilization of micro-methods in analytical chemistry, recent years have witnessed the use of innumerable organic reagents which are becoming increasingly important in delicate analytical practice. In the book under review, which is the ninth and enlarged edition of the Book of Reagents, published in 1932, directions for the use of 71 of the important organic reagents are given. Adequate descriptive matter relating to spot tests as applied to micro-analysis, clear working details for many colorimetric determinations, a number of methods of analysis in which organic reagents are used, new and improved directions for the use of many of the organic reagents utilized in analytical practice, comprehensive and up-to-date bibliography to include relevant methods in published literature appended for each reagent and finally alphabetically listed index of compounds are the salient features of this useful book.

Organic reagents such as dihydroxy-tartaric acid osazone included as a reagent for the detection of calcium in the previous edition, has been omitted since experience has shown that it had but limited value over more orthodox methods. Phenyl-thiohydantoic acid used for the determination of cobalt, phenylaminobenzene-azo-benzene sulphonic acid employed for the colorimetric determination of magnesium, have been omitted for similar reasons. Four additional organic reagents, *viz.*, tri-ketohydridine hydrate for the determination of free amino acids, 8-hydroxyquinaldine useful for the gravimetric determination of zinc, benzyl-isothiourea hydrochloride for the characterization of sulphonic acids, *p*-nitro-benzene-azo-orcinol for the evaluation of minute quantities of beryllium in alloys are included.

The book has been skilfully compiled; not merely rearranging the matter previously published, but significant changes in the methods previously published, new and improved directions to include up-to-date procedures in analytical practice have been incorporated. This book can be unreservedly recommended to chemists and workers associated in conducting delicate chemical analysis.

M. S. MUTHANA.

Snow Balls of Garhwal. (The Universal Publishers Limited, Lucknow), 1946. Pp. 87. Price Rs. 3-12-0.

Notwithstanding the uninterrupted march of modern science and concomitant economic and cultural progress the effects of which are strikingly and prominently visible in the different strata of societies influenced and moulded by such progress, there exist even to-day specifically patterned tribes and sections of humanity living in hills and jungles their own curious lives untouched by the forces that constitute the so-called modern civilization scientific and systematic study of which is bound to throw considerable light on the evolution of mankind in general and the penetration of civilization in particular to the nooks and corners of social organizations. Thus, from the standpoint of Sociology and Anthropology, the studies brought together in the volume under notice are bound to be of immense interest to all students of mankind. The volume under notice stands in TWO parts. The FIRST part opens with a discussion and constructive elucidation of the basic and essential characteristics of the different tribes by D. N. Majumdar, who, writing under the heading "*Malaise* of Culture", points out that there are "over THIRTY-MILLION

primitive tribes in India and about FIFTY-MILLION 'scheduled', 'depressed', etc., classes, and emphasizes the need for a thoroughgoing study of the habits of life and culture of these tribes". "Indian Folk-Lore" is the subject-matter of a learned contribution from Sir Sita Ram. He has brought together certain typical songs sung by the village-folk in connection with celebration of marriages, child-births, etc. In the next contribution "Santal Marriage Songs" have been done into English by W. G. Archer. In the fourth contribution, "The Folk-Songs of Dangi Bhils" in choice collection, are brought together and explained by D. P. Khanapurkar. In the SECOND part entitled "Snow Balls of Garhwal", Dr. N. S. Bhandari presents about sixty Folk-songs collected by him during an ethnographic tour undertaken in connection with collection of data for his Doctorate Thesis, the tour covering the interior of Garhwal. The volume contains a number of attractive Lino-Cuts by L. M. Sen.

From the foresketched summary of the main contribution made by the volume under notice which forms a member of the "Folk-Lore Series", edited by D. N. Majumdar, it should be admitted that the life led by the members of the so-called civilized sections of a nation or a country can hardly be taken as affording a full and complete picture or portraiture of the social organization as a whole. A scientific, objective study of the manners and customs of these primitive tribes is one thing, while a concerted attempt at taking the benefits of modern civilization to the very doors of these primitive tribes is totally another. D. N. Majumdar complains, "Wherever missionary influence has been long and durable Christian ideas have disintegrated tribal life and destroyed tribal values". That cannot be helped. If as the result of the advancement of modern science and scientific inventions, civil aviation becomes as it now has, a matter of daily routine means of communication, there is absolutely no use or good in pathetically clinging to the bullock-cart mentality, though, of course, it would be perfectly legitimate and amusing to exhibit the bullock-cart on postage-stamps in grateful remembrance of its past help and services. When a new ideology and a new practical methodology based on it assail primitive tribes as they must in any attempt at making or helping them share the benefits of civilization, a disruption of their old patterns of life and individual and communal behaviourism must be deemed inevitable. It would be withal unethical and immoral to seek to perpetuate the tribal patterns simply as sociological and anthropological museum-specimens, for purposes of comparative research and investigation. If, as the result of infiltration of new ideas, tribal methods of life as in the case of the Chota-Nagpur labour-women change for the worse as it must seem on account of free sex-relations and so forth, there would be no good shedding tears over the disruption and disappearance of tribal patterns and values.

Two significant lines of reform can safely be indicated. From the folk-song given on p. x, relating to the incestuous relation between an aged father and a lusty and attractive daughter, it is evident that many tribes need to be taught elementary principles of morality as illustrated in monogamy, eradication of incestuous unions, etc., and such a reformation can well be brought about on the basis and foundation of a nucleus supplied by the tribal culture itself. By this method, both ends may easily be achieved—preservation of the essentials of the tribal culture and radical rehabilitation or reconstruction of the tribal moral outlook. (2) The second would be the reclamation or humanization of the criminal tribes which seem to number in the neighbourhood of two million souls and over. The State and the humanitarian organizations must take courage in both hands and endeavour in a concerted and persistent manner to wean these millions from criminal and anti-social patterns of behaviour. With your permission, I shall extract some few lines from a touching message from a wife to an absentee husband, which is strongly and powerfully reminiscent of Kalidasa's celebrated *Meghadoota* :—

Hark, hark, you morning breeze,
Tell my lord I waited him come
. . . . . .
A flash of lightning,
And nowhere was he,
Thundering came the clouds,
I remained UNMOVED . . . . . .

But, then, God, and her *Karma* are to be blamed. The lord never returned.

College and University Libraries must have this excellent volume, the preparation of which must have cost a lot of pure labour or love. The authors of the different papers and discussions have done a valuable service to the cause of sociology and anthropology.

R. NAGA RAJA SARMA.

(1) Technological Reports on Standard Indian Cottons, 1945. By Nazir Ahmad. Director, Technological Laboratory, Maturga, Bombay. (Indian Central Cotton Committee, Technological Bulletin Series A, No. 63.) Price Rs. 1-8-0.

(2) Technological Reports on Trade Varieties of Indian Cottons, 1945. By D. L. Sen, Officiating Director, Technological Laboratory, Bombay. (Indian Central Cotton Committee, Technological Bulletin Series A, No. 64.) Price Rs. 1-8-0.

1. The Bulletin No. 63 (perhaps the last by the present author), a useful annual feature of the Technological Laboratory of the Indian Central Cotton Committee, runs to 107 pages and is an authoritative compendium of the results of exhaustive tests on 19 Standard Indian Cottons of the season 1944-45. The Cottons are tested for their fibre characters. They are processed and spun under optimum conditions and the yarns tested for various properties. The results are given not only for the 1944-45 crop but also for the earlier seasons ever since the type was first tested as a Standard Cotton, sometimes dating back to 1926-27. These "Standard Cottons" "have no relation whatever with the trade standards" but "are mostly botanically pure types which are selected with special reference to yield, ginning outturn, fibre-properties and spinning performance" (p. 3). They are grown under known condi-

tions in Government Agricultural Farms and "include a few types from each Province" (p. 2). This comprehensive report marks the progressive development in the quality of the Indian cotton crop by the efforts of the Department of Agriculture.

The Report follows the usual lines with a short Preface, a Table of Contents followed by an explanatory Introduction about the objects of the tests, *viz.*, "to establish a scale of reference for the entire Indian cotton crop", "for the study of seasonal variations in the fibre properties and spinning performance", "to furnish the necessary data for the correlation of fibre properties of Indian cottons" with their "spinning performance" and "to place in the hands of the trade detailed information regarding the Standard Cottons" (pp. 6 and 7); the technique of processing and testing; and the plan of presentation of the results. Included in it are a few special features like (*a*) A Table of Characteristics of Indian Cottons (p. 2), (*b*) A List of Acreage of the Standard Cottons (p. 3) and (c) A Note on "Seasonal Variations of Standard Cottons" (p. 9). Individual detailed reports for the 19 Standard Cottons tested are then given. In each case the seasons during which it is tested, the agricultural details including acreage, the grader's report, fibre test results, sequence of machinery employed in spinning, the Spinning Master's report, remarks based on the test results, the highest standard warp count for which the cotton is adjudged suitable for the various seasons and details of spinning test results, are given. The Bulletin ends with highly useful consolidated tables of results of fibre tests in English and Metric units, for all cottons for all the seasons tested, along with a summary table of spinning test results from 1935 to 1945 classifying the cottons according to provinces of origin.

From p. 11, it is heartening to note that "there is a good deal of evidence to show that on the one hand the quality of the crop, as a whole, is improving from year to year, and on the other the area under standard Indian cottons is increasing steadily". From p. 12, it is noticed that on the whole, "a great majority of the cottons of the 1944-45 season, as represented by the samples sent to the Laboratory for tests, gave practically the same spinning test results as in the last season".

One special feature of the results, *viz.*, the difference between the roller-ginned and saw-ginned samples of Sind Sudhar and Sind American M4, is worth noting, the saw-ginned samples spinning better and always fetching much higher price (pp. 33-48).

It is felt that the utility of the report would be enhanced by the inclusion of a few items, *e.g.*, (1) In the table on p. 2, a column for yield per acre and another for production during the previous season. (2) In the list on p. 3, acreage for the previous year. (3) Definition of Highest Standard Warp Count, and the Standard Twist Constant employed. and (4) Photographs of evenness standards which would prove highly useful.

2. While Series A, No. 63, refers to the tests on 19 Standard Cottons only, No. 64 is a sister-bulletin referring to the tests on 39 samples of "Trade Varieties" of the 1944-45 Indian Cotton Crop. This also is an annual publication of the Indian Central Cotton Committee, the results being confined to spinning tests only. While the report on Standard Cottons assists the cotton breeder and the cotton scientist, these tests on "representative trade varieties" "renders more direct assistance to the cotton trade and the textile industry" (p. i). The objects of the tests are to provide "reliable information regarding the waste losses and the spinning performance of the chief types of Indian cottons" and for knowing "whether a particular variety of cotton was maintaining its quality or showing signs of improvement or deterioration" (p. i), to enable necessary measures to be taken.

The samples representative of the fair average quality of the season's crop of the whole country obtained mostly through the East India Cotton Association and the Mill Owners' Associations, are spun and the yarns tested.

The Report opens with a Table of Contents followed by an Introduction which deals with the objects of the test, the choice of samples and the plan of presentation of results. This is followed by detailed reports on each cotton, comprising the source of sample, seasons of test, sequence of spinning machinery, Spinning Master's report on cotton and yarn, the grader's valuation report and the table of spinning test results. The Bulletin running to 97 pages closes with a report on three varieties of African cottons "used in considerable quantities in the Indian mills" (p. viii).

The usefulness of this report as an immediate guide to the trade regarding the quality of the season's crop would be enhanced if its publication could be expedited securing early samples. Inclusion of the spinning value of each sample in the table of results would facilitate a comparative study of the behaviour of a variety from season to season. The acreage under each cotton and the Province of growth would be valuable information.

While it has been decided to issue a separate leaflet containing "comparative results for trade varieties and the corresponding standard cottons" (p. viii) the simultaneous publication of both would be helpful.

The trade should be grateful for the publication of these authentic reports of spinning tests conducted under reproducible conditions as they provide a valuable standard of reference for comparing the performance of the commercial crop under mill conditions.

The get-up of the Bulletins is of the usual high standard except that the paper used reminds one that it is yet a war-time publication! They are moderately priced at Rs. 1-8-0 per copy.

SRI NAGABHUSHANA.

SCIENCE NOTES AND NEWS

Rice Straw.—Rice straw, as cattle feed, becomes more digestible and more nutritive after it has been soaked in dilute caustic soda solution. The improvement in the nutritive value by this alkali treatment accelerates growth in cattle by 67-74 per cent. It has been found that the feeding of treated straw to young stock is economical the animals look healthier and enter into reproductive life earlier. The soaking and washing of rice-straw in plain water, although it does not produce the spectacular results of alkali treatment, is also benecial and the feeding value of rice straw is brought at par with that of the wheat straw.

Industrial Development.—MR. C. RAJAGOPALACHARI, Member for Industries and Supplies, presiding over a meeting of the Council of Scientific and Industrial Research, emphasised that the Board should aim at real help to industry. He deplored that India had to depend on other countries for food. He felt that things would have to be organised so that in the matters of food and clothing we should not depend on external assistance, and any industrial development in the country that would help this must have priority.

All industrialisation plans and schemes should keep in mind the unalterable facts of our population and our rural economy. But, it was not the intention that all-round scientific investigation should not be encouraged. He appealed to the scientists that they should not subordinate themselves to the whims and fancies of politicians however illustrious they may be. They should owe allegiance only to the Science and Truth.

The Governing Body of the C.S.I.R. sanctioned several new schemes of research on the recommendation of the Advisory Board costing about Rs 2,60,000. The schemes include Atomic research at the Tata Institute of Fundamental Research, Bombay, and the Bose Research Institute.

The Governing Body approved the final plans for the establishment of the Fuel Research Institute and the National Metallurgical Laboratory in India. The Fuel Research Institute is to be located near Dhanbad at an estimated capital cost of Rs. 14 lakhs and the National Metallurgical Laboratory will be located at Jamshedpur with an initial capital expenditure of Rs. 42·8 lakhs. Architects for these laboratories have already been appointed by the Council and detailed estimates, plans and designs will be submitted by them for the approval of the Council.

The Governing Body noted with satisfaction that the Government of Bombay had agreed to the location of the National Chemical Laboratory on the Pashan Road at Poona and that the required land would be transferred to the Council for this purpose.

India will participate in the first General Conference of the United Nations Educational, Scientific and Cultural Organisation, to be held in Paris in November 1946. Sir S. Radhakrishnan, Vice-Chancellor of Benares Hindu University, will lead the Indian delegation which includes Rajkumari Amrit Kaur and three others, whose names will be announced shortly. One will be a representative from the Indian States. The delegation will leave India at the end of October.

During the year (1945-46) the Millowners' Association of Ahmedabad have decided to establish a Research Institute for Textile Technology in Ahmedabad and for that purpose to raise a fund of Rs. 48 lakhs, to be subscribed to by member-mills on the basis of installed looms and spindles *plus* a certain percentage of the standard profits.

Extensive fruit and fisheries research is to be undertaken by the Imperial Council of Agricultural Research and the new Central Fisheries Research Institute. For the latter the Government propose to buy in the U.K. and U.S.A. four modern fishing boats and may also acquire a trawler from the Royal Indian Navy. Cold storage plants will also be bought abroad.

The establishment of a Rice Research Institute, which involves a non-recurring expenditure of Rs. 4,50,000 and a recurring one of Rs. 34,000 in 1946-47, is another item included by the Agricultural Department. The Central Institute, which will be located at Cuttack, will concentrate on fundamental research. An overall expansion and re-organisation of the Imperial Agricultural Research Institute is contemplated and for this a non-recurring grant of Rs. 32,97,217 and a recurring one of Rs. 2,32,667 in 1946-47 has been sanctioned, the estimated cost of the entire scheme spread over five years being Rs. 1,32,75,750.

GEOMAGNETIC STORMS

Some details of geomagnetic storms which have been recorded at the Alibag Observatory for the half year ending September 1946 and which have been classified as great or very great according to the standards of the Alibag Observatory have been given in the following table in which t_m, t represent the time (I.S.T.) of commencement of the storm and its intense phase respectively and T, the duration of the intense phase expressed in hours. The ranges in the three different elements (D, H and V) of the earth's magnetic field as recorded at the Alibag Magnetic Observatory during the storms have also been given, D, in minutes of arc and H and V in γ where $1\gamma = 10^{-5}$ gauss. The maximum k-index k_m recorded during the storm has also been given.

Date	t_0	t	T	Range			k_m	Nature of commencement
				D	H	V		
1946	h. m.	h. m	hrs.	min.	γ	γ		
April 22–25	12 28	17 00	29	11·7	345	87	6	Sudden
July 27	00 15	00 15	13	12·5	499	103	8	Sudden
Sept. 18–19	05 18	05 18	13	6·9	283	68	7	Sudden
Sept. 21–23	22 41	15 40 Sept. 22	9	8·2	425	146	9	Sudden
Sept. 27–29	About 11 30	18 00 Sept. 28	7	5·3	222	57	6	Gradual

The geomagnetic storm of July 27, was remarkable for the sudden enormous initial rise of 147 gammas in H in about a minute and followed by rapid low-amplitude oscillations in all the three elements resulting in a number of peaks in both H and V. The story of September 11-23 recorded a number of large oscillations during its intense phase.

The Eastern Technical Institution will provide facilities for instruction for about 2,000 undergraduates and 1,000 post-graduate students. The Sarkar Committee, set up early in 1945, had recommended the establishment of four such higher technical institutions. The Eastern Higher Technical Institution may, therefore, be regarded as a start in Government's programme of technical education, and it is understood that it will cater for the needs of all the provinces. The scheme will involve in the current financial year a non-recurring expenditure of Rs. 4,25,000 and a recurring one of Rs. 1,62,000, while the estimates for the three subsequent years are, non-recurring Rs. 91 lakhs, Rs. 1,04,50,000 and Rs. 1,05,20,000 and recurring Rs. 10,977,000, Rs. 26,79,300 and Rs. 39,52,000 respectively.

DR. W. P. AYKROYD has been appointed Director of the Nutrition Division of the Food and Agricultural Organisation of the United Nations. Dr. Aykroyd was formerly Director of the Nutrition Research Laboratories at Coonoor.

The International Association of Wood Anatomists has elected DR. K. A. CHOWDHURY, M.B.E., D.SC., F.N.I., Wood Technologist, Forest Research Institute, Dehra Dun, to its Council. He is the first Indian scientist to be elected to the Council of this international organization.

DR. WALI MOHAMAD has been appointed Vice-Chancellor of the Osmania University. Dr. Mohamad was formerly the Head of the Department of Physics, Lucknow University.

DR. V. N. PATWARDHAN has been appointed Director, Nutrition Research Laboratories (I.R.F.A.), Coonoor.

DR. HUGO OSVALD, Professor of Plant Husbandry, at the College of Agriculture, Uppsala, Sweden, and Secretary of the Executive Committee of the Seventh International Botanical Congress, has been visiting the U.S.A. On July 20, he was the guest of the American officers of the Botanical Section of the International Union of Biological Sciences (the official holdover committee of the congress) at Harvard University, with whom he discussed plans for the next Congress. This will be held in Stockholm, in the early summer of 1950.

DR. FRANS VERDOORN, Botanical Secretary of the Union, has, at the request of the Executive Committee, undertaken to prepare a new international plant science register and directory (along the lines of the early volumes of *Chronica Botanica*), this will be issued about a year before the Congress.

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